EchoFree™
EF1210
Multi-Channel Acoustic Echo and Noise Canceller
User Manual

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INTRODUCTION

Congratulations!

Congratulations on your purchase of the EchoFree™ EF1210 Multi-Channel Acoustic Echo and Noise Canceller. By choosing ASPI Digital's EchoFree™ products, you are investing in cutting edge DSP technology that will help provide the best possible audio quality for your system.

How to Use This Manual

This manual is a reference manual for your EF1210. It is structured to provide the information you need quickly and conveniently. The following is an overview of each section:

- *Quick Installation* gives an overview of the installation process including an outline of hardware installation as well as calibration of the EF1210. It also includes a quick reference for calibration — use the quick reference only if you are very familiar with the EF1210 since it is just an outline of steps without detailed explanations.
- *Advanced Installation* gives more detailed technical information on the installation, configuration and calibration of the EF1210.
- *Operating the EF1210* outlines using the EF1210 with and without RS-232 control.
- *Troubleshooting* helps to debug problems with installation.
- *Technical Specifications* provides the technical specifications of the EF1210.
- *Warranty Information*
- *EF1210 Command Set Reference* contains instructions on how to send RS-232 commands to the EF1210 as well as a reference of the RS-232 commands.
- *Applications* briefly describes using the EF1210 in different applications.
- *EF1210 Block Diagram*
- *Connector Pinouts*
- *Connecting Balanced Equipment to Unbalanced Equipment*

Product Description

The EF1210 Multi-Channel Acoustic Echo and Noise Canceller installs between the room's microphones and the automatic mixing system, providing individual channel noise cancellation and acoustic echo cancellation. The EF1210 works with most vendors' automixing systems to provide conferencing capability to new and existing rooms.

Unlike most echo cancellers, the EF1210 requires no training sequence to learn a room's echo response. After the unit has been installed, all you have to do is turn it on. No further adjustments are required. ASPI's echo cancellation algorithm offers speed, flexibility and superior audio quality to your conference room setup.

The speed at which an echo canceller matches the actual sound of a room (the convergence rate) is a direct indication of the product's quality. Faster convergence allows better conference quality by instantly adapting to changing room environments such as moving microphones, changing volumes or people moving around the room. Our echo cancellers are designed to provide faster convergence and better performance than other echo cancellers. This means that the EF1210 adapts to changes in room acoustics during conversations quickly for consistent performance throughout the

conversation. At a convergence rate of 30 dB per second, ASPI echo cancellers are the fastest on the market.

Because the EF1210 supports a wider range of acoustic gain than most echo cancellers, it offers greater flexibility in loudspeaker and microphone placement. Most echo cancellers can only operate properly at less than 0 dB of acoustic gain. Breaking through this threshold can cause echoes and howling as loudspeaker levels overpower the microphones. That can leave you with few options when designing audio or video conference rooms. A wider range of acoustic gain results in a smaller danger zone, allowing the Systems Designer greater flexibility when placing loudspeakers and microphones or setting volume levels.

ASPI's superior audio quality allows all parties to communicate freely and naturally, without echoes, switching noises, clipping of words, or dropout of speech. A patented state-logic algorithm ensures smooth and natural communications without typical speakerphone performance problems.

ASPI's proprietary noise cancellation on each of the inputs helps to keep overall noise to a minimum. ASPI echo cancellers are the only ones on the market to feature this patent pending technology. Noise cancellation filters out ambient background noise such as HVAC, LCD projectors, and road noise. Our noise cancellation technology is not a noise gate. It actually removes noise. Therefore, it enhances the operation and improves the sound quality of an automixer, for example, by preventing it from bringing the noise level up and down when microphones are gated on and off. By cancelling the noise picked up by each microphone, the overall SNR is preserved. The result is crystal clear speech over a greater decibel range than any other echo canceller. That means reduced listener fatigue and a higher quality audio conference.

The EF1210 is also fully RS-232 controllable via all popular room control systems, and provides links to other ASPI products, such as the EF200 Phone Add.

Warranty Registration

Please take a moment to fill out and return your warranty registration card. This information will help us to provide you with better customer support.

PRODUCT FEATURES

- 8 microphone/line level inputs
- Phantom power on each input
- Ambient noise cancellation (patent pending) on each input
- Fast convergence rate of 30 dB/sec
- Works in environments with up to 10 dB of room gain
- Links to other ASPI devices such as EF200 Phone Add
- Compatible with most matrix and automixers
- Fully RS-232 controllable via room controllers
- Front panel lock-out capability
- Can be used as a wideband noise canceller (20 kHz bandwidth) when AEC is disabled
- Long "Tail Time" supports even the most difficult of rooms (200 ms)
- Supports up to two AEC reference input signals
- Supports record and playback
- Ability to store user configurations in non-volatile memory
- Digitally controlled analog trimpots
- Phoenix connectors for audio input and output
- Single rack unit width and height

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- Pink noise generator for calibration mode
- 2 year warranty

QUICK INSTALLATION

Installation of the EF1210 involves two procedures: hardware installation, and calibration.

HARDWARE INSTALLATION

Hardware installation involves the following steps:

1. Set rear panel DIP switches to select Line or Mic level and enable phantom power for each microphone input channel, and to select ASPI Bus Device ID if necessary. See "Configuration" on page 15.
2. Connect input and output signals (See "Connecting the EF1210 to other equipment" on page 19):
   - Connect the 8 Mic/Line Inputs to microphones.
   - Connect the 8 Line Outputs to the inputs of a mixer.
   - Turn off Phantom Power on automixer.
   - Connect Zone Output(s) to amplifier(s) or powered loudspeaker(s).
   - Connect AEC Reference Inputs to the TO AEC output of an EF200 or to the output of a CODEC.
   - If you wish to use the EF1210's built in Playback/Record mixer feature, connect AMIX IN, AUX IN, TO CODEC, and REC as directed in "Playback/Record" on page 22.
3. If you are using an RS232 remote control device, connect it to the RS-232 REMOTE CONTROL port; if you are controlling multiple ASPI devices, connect them using the ASPI Bus ports (See "Connecting the ASPI Bus" on page 26).
4. Connect the external power supply.

Caution! ***The EF1210 is designed to maintain a 1/4" (6.35 mm) air circulation clearance above the enclosure. Do not stack or install EF1210s in such a way as to defeat this clearance, block the side vent holes, or otherwise impede air circulation around the EF1210.***

CALIBRATION

Calibration of the EF1210 involves a sequence of five calibration steps to configure the input and output levels of the EF1210 to match those of the equipment to which it is connected. The EF1210 can be calibrated either from the front panel or by using a computer. Please refer to "Calibration" on page 27 for more detailed information on the Calibration procedure. Correct calibration is essential for satisfactory operation of the EF1210, so please take the time to familiarize yourself with the details of the Calibration procedure by reading "Calibration" on page 27.

For front panel calibration, enter Calibration mode by pressing and holding the AUX IN LEVEL/SETUP and INPUT SELECT front panel buttons for 2 seconds. In Calibration mode, the SETUP LED will blink to let you know which setup step you are currently executing. Press the AUX IN LEVEL/SETUP button to move from one Calibration step to the next. When you have finished Calibration step 5, press the AUX IN LEVEL/SETUP button again to exit Calibration mode; any changes that you made will be saved as the default power-on settings when you exit the Calibration procedure.

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If you miss a Calibration step or lose your place and get to the wrong Calibration step, you may either continue and come back to the missed step later or exit Calibration mode (by pressing AUX IN LEVEL/SETUP repeatedly until the SETUP LED is no longer illuminated), re-enter Calibration mode, and resume Calibration at the step that you missed. If you wish to exit Calibration mode and discard any changes that you made, you must cycle power on the EF1210 before exiting Calibration mode.

EF1210 CALIBRATION QUICK REFERENCE

Legend: ○ LED Off ✸ LED On ✸ LED Blinking ● Button

Calibration Step 1: Calibrating Microphone Input Channels

1.1. Press and hold the AUX IN LEVEL/SETUP and the INPUT SELECT buttons for 2 seconds to enter setup. SETUP LED blinks once per period.

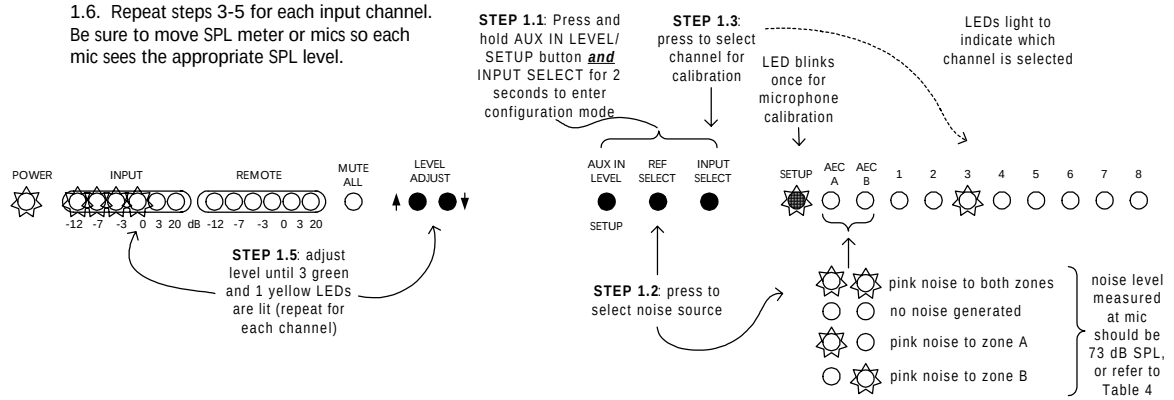
1.2. Press REF SELECT to select noise output source.

1.3. Press INPUT SELECT to select input channel to calibrate.

1.4. Place SPL meter beside mic pointing in the same direction. Adjust loudspeaker for 73 dB SPL at mic (for boundary mics) or refer to Table 4 in Calibration Section for other mic types.

1.5. Press LEVEL ADJUST until first yellow LED (0 dB) on INPUT meter is lit on INPUT meter.

1.6. Repeat steps 3-5 for each input channel. Be sure to move SPL meter or mics so each mic sees the appropriate SPL level.


STEP 1.1: Press and hold AUX IN LEVEL/ SETUP button and INPUT SELECT for 2 seconds to enter configuration mode
STEP 1.3: press to select channel for calibration
LED blinks once for microphone calibration
LEDs light to indicate which channel is selected
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 1.5: adjust level until 3 green and 1 yellow LEDs are lit (repeat for each channel)
STEP 1.2: press to select noise source
pink noise to both zones
no noise generated
pink noise to zone A
pink noise to zone B
noise level measured at mic should be 73 dB SPL, or refer to Table 4

Calibration Step 2: Calibrating Zone Outputs, Check Acoustic Gain

2.1. Press the AUX IN LEVEL/SETUP button to enter Zone Output Calibration. SETUP LED blinks twice per period.

2.2. Press REF SELECT to select noise output source (we recommend using both zones simultaneously).

2.3. Select nominal output level for your room audio amplifier with LEVEL ADJUST (press UP for 0 dBu, DOWN for -10dBV).

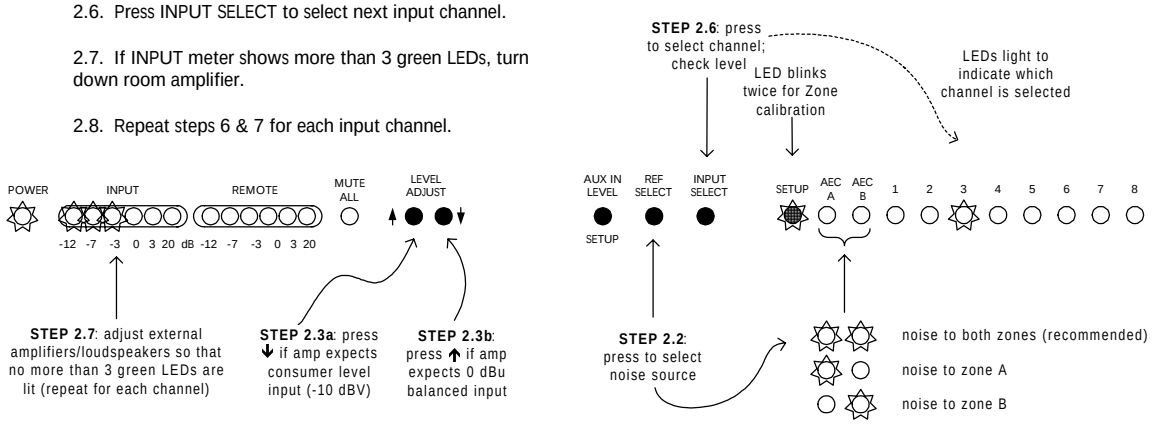
2.4. Repeat for other Zone output if appropriate. Then return all mics to their operating position and orientation.

2.5. Check acoustic gain limit. Adjust external amplifiers/loudspeakers so that the loudspeaker volume is almost uncomfortably loud OR no more than 3 green LEDs are lit on INPUT meter.

2.6. Press INPUT SELECT to select next input channel.

2.7. If INPUT meter shows more than 3 green LEDs, turn down room amplifier.

2.8. Repeat steps 6 & 7 for each input channel.


STEP 2.6: press to select channel; check level
LED blinks twice for Zone calibration
LEDs light to indicate which channel is selected
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 2.7: adjust external amplifiers/loudspeakers so that no more than 3 green LEDs are lit (repeat for each channel)
STEP 2.3a: press ↓ if amp expects consumer level input (-10 dBV)
STEP 2.3b: press ↑ if amp expects 0 dBu balanced input
STEP 2.2: press to select noise source
noise to both zones (recommended)
noise to zone A
noise to zone B

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Calibration Step 3: Calibrating AEC Reference Input

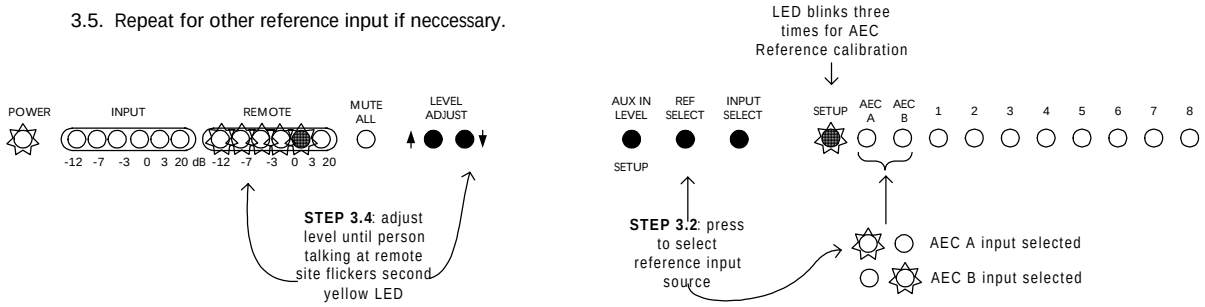
3.1. Press AUX IN LEVEL/SETUP button again to enter Ref Input calibration. The SETUP LED blinks 3 times per period.

3.2. Press REF SELECT to select input source (AEC A or AEC B). Single zone installation will use AEC A.

3.3. Establish live connection to remote site(s) and have remote party talk normally.

3.4. Press LEVEL ADJUST until first yellow LED on REMOTE meter is flickering regularly and 2nd yellow is flickering rarely.

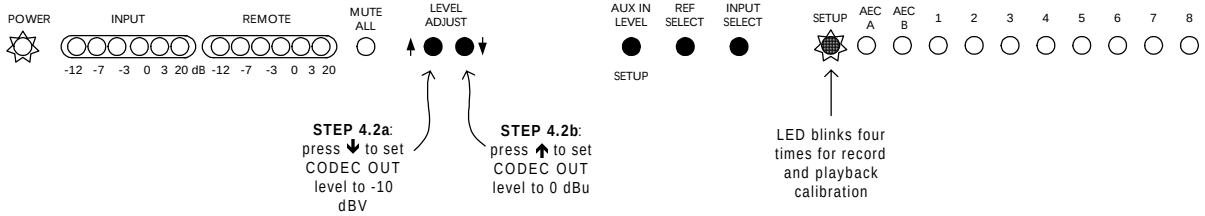
3.5. Repeat for other reference input if neccessary.


LED blinks three times for AEC Reference calibration
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 3.4: adjust level until person talking at remote site flickers second yellow LED
STEP 3.2: press to select reference input source
AEC A input selected
AEC B input selected

Calibration Step 4: Calibrating for Playback and Record

4.1. Press the AUX IN LEVEL/SETUP button to enter Playback/Record calibration. The SETUP LED blinks 4 times per period. This step may be omitted if you are not using the internal EF1210 mixers to implement playback and record.

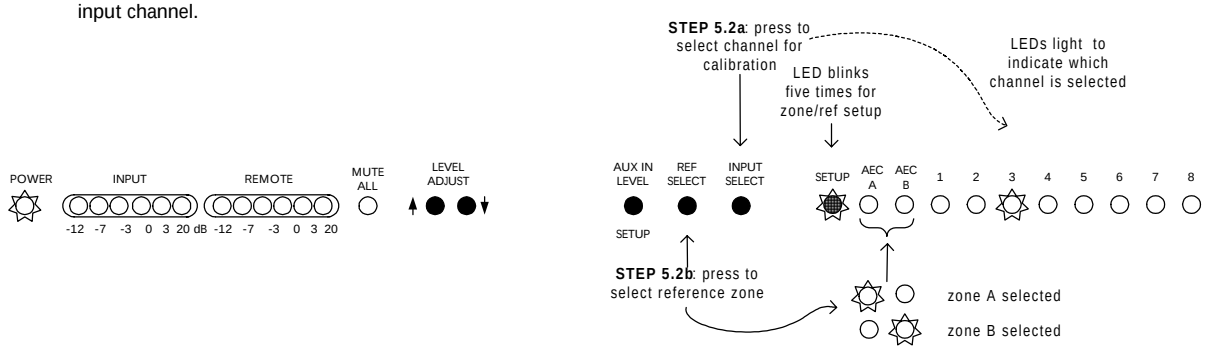
4.2. Press LEVEL ADJUST DOWN to set CODEC OUT level to -10 dBV, press LEVEL ADJUST UP to set CODEC OUT level to 0 dBu.


POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 4.2a: press ↓ to set CODEC OUT level to -10 dBV
STEP 4.2b: press ↑ to set CODEC OUT level to 0 dBu
LED blinks four times for record and playback calibration

Calibration Step 5: Zone/Reference Setup

5.1. Press the AUX IN LEVEL/SETUP button to enter Zone/Reference Setup. The SETUP LED blinks 5 times per period. This step may be omitted for single zone installations.

5.2. Use INPUT SELECT to cycle through each input channel. Use REF SELECT to select corresponding reference input for each input channel.


STEP 5.2a: press to select channel for calibration
LED blinks five times for zone/ref setup
LEDs light to indicate which channel is selected
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 5.2b: press to select reference zone
zone A selected
zone B selected

ADVANCED INSTALLATION

The installation procedure for the EF1210 consists of the following steps:

1. Prepare for installation (below).
2. Configure the DIP switches to accept appropriate levels from microphones or mixer (See “Configuration” on page 15).
3. Connect the EF1210 to other equipment (See “Connecting the EF1210 to other equipment” on page 19).
4. Calibrate the EF1210 (See “Calibration” on page 27).

PREPARING FOR INSTALLATION

Reading the entire manual (or at least the advanced installation section) before beginning the installation process will help you be more prepared for installation. Also, please make sure you have the correct equipment (outlined below) before you begin installation.

What’s Included

The EF1210 product package includes the following items:

- EF1210 User Manual (this manual)
- EF1210 MultiChannel Acoustic Echo and Noise Canceller
- External Power Supply with a cable clamp for strain relief
- Diskette with EFPanel Control Software
- Warranty Registration Card

What’s Not Included

The following equipment is not included with the EF1210 product package, but may be necessary to create a completely functional system:

- Microphones
- Loudspeakers
- Audio amplifier (or amplified loudspeaker)
- EchoFree™ EF200 Phone Add (*see Note below)*
- Automatic microphone mixer or matrix mixer
- Audio cables
- Videoconferencing CODEC or other four-wire interface (optional)
- RS-232 remote control device (optional)

Tools Needed

- Sound Level Meter (SPL meter)
- Screwdriver to mount EF1210 in your rack

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Note. *The EchoFree™ EF200 Phone Add provides a full duplex interface between a four-wire audio system and a two-wire telephone line. It allows a telephone caller to be brought in to any four-wire audio system. The EF200 is similar to a digital hybrid, but with many more features and capabilities. The primary function of the EF200 is the line echo canceller (LEC), which digitally eliminates reflections from the telephone hybrid. The EF200 is the recommended Phone Add for any application.*

EF1210 FRONT AND REAR PANELS

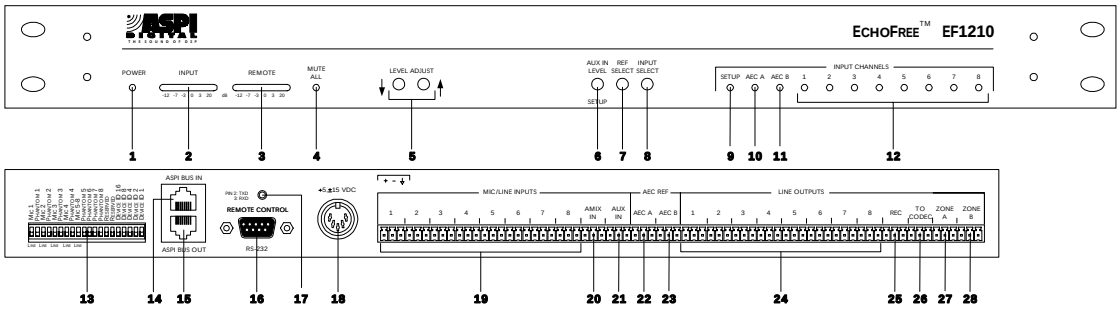

Figure 1. EF1210 Front and Rear Panels

1. POWER INDICATOR. When the LED is green, power is on.
2. INPUT SIGNAL LEVEL INDICATOR. Indicates level activity on any one of the 8 mic input signals (selected by INPUT SELECT button).
3. REMOTE SIGNAL LEVEL INDICATOR. Indicates level activity on either of the two reference signals (selected by REF SELECT button).
4. MUTE ALL LED. This LED is only ON when all 8 LINE OUTPUT channels are muted. If only some of the channels are muted, the LED will not be ON.
5. LEVEL ADJUST. Adjusts digital trimpot levels for the 8 microphone inputs, 2 reference inputs, 2 zone outputs, CODEC output, and Aux input (used in conjunction with the AUX IN LEVEL/SETUP button).
6. AUX IN LEVEL/SETUP. Press and hold both this button and the INPUT SELECT button for 2 seconds to put the EF1210 into configuration mode. Pressing the AUX IN LEVEL/SETUP button again selects between configuration modes in the calibration process. During normal operation, press and hold the AUX IN LEVEL/SETUP button and use the LEVEL ADJUST buttons to adjust the playback level of your program audio device.
7. REF SELECT BUTTON. During normal operation, this button selects which reference input (AEC A or AEC B) is shown on the REMOTE LEVEL INDICATOR. During setup, it has different functions depending on the setup step.
8. INPUT SELECT BUTTON. During normal operation, this button selects which one of the 8 MIC input channels is shown on the INPUT SIGNAL LEVEL INDICATOR (LED meter). It is also used with the AUX IN LEVEL/SETUP button to enter setup mode. During setup, it has different functions depending on the setup step.
9. SETUP LED. Flashes to indicate the current setup step. This LED is OFF during normal operation.
10. AEC A LED. During normal operation, this LED indicates if reference input A (AEC A) is selected for display on the REMOTE LEVEL INDICATOR. During setup, it has different functions depending on the setup step.
11. AEC B LED. During normal operation, this LED indicates if reference input B (AEC B) is selected for display on the REMOTE LEVEL INDICATOR. During setup, it has different functions depending on the setup step.
12. INPUT CHANNEL LEDS. During normal operation, these LEDs indicate which input channel is selected for display on the INPUT LEVEL INDICATOR. During setup, it has different functions depending on the setup step.
13. DIP SWITCHES. Select mic or line level inputs, phantom power, and ASPI Bus ID.

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14. ASPI BUS IN. Connects to the ASPI BUS OUT of another ASPI Digital device.
15. ASPI BUS OUT. Connects to the ASPI BUS IN of another ASPI Digital device.
16. RS-232 REMOTE CONTROL PORT. Connect this to an optional RS-232 remote control device, such as a touch panel or personal computer COM port.
17. THREADED HOLE FOR POWER SUPPLY CABLE CLAMP. Use the provided cable clamp to clamp the power supply cable to the back panel of the EF1210 for strain relief.
18. POWER SUPPLY INPUT. Connects to the external power supply provided with the EF1210.

Caution! ***Use only the power supply provided with the EF1210. Use of other power supplies will void the warranty and may cause damage.***

19. MIC/LINE INPUTS. Connects to microphone at either mic or line level, with or without phantom power (both selectable with DIP switches).
20. AMIX IN. Connects to the output of the automixer. This is internally mixed with AEC A and is output to REC. This is only needed when recording from the EF1210. See "Playback/Record" on page 22 for a description of the Record and Playback mixer circuitry. See also 'TO CODEC" (number 26).

Note. *AMIX IN must be a 0 dBu signal.*

21. AUX IN. Connects to the output of a tape recorder, VCR, or other recording device. Playback from a program audio device is only available with the Reference A input signal. See "Playback/Record" on page 22 for a description of the Record and Playback mixer circuitry.
22. AEC A REF INPUT. Connect to the output of a CODEC or hybrid connected to Zone A.
23. AEC B REF INPUT. Connect to the output of a CODEC or a hybrid connected to Zone B.
24. LINE OUTPUTS. Connect to the inputs of an automixer or matrix mixer.

Caution! ***Set mixer inputs to 0 dBu line level, phantom power OFF.***

25. REC. Connects to a recording device. REC requires taking the output from the automixer (or an output of a matrix mixer) and plugging that back into the EF1210 so that the local side of the conference can be recorded. See "Playback/Record" on page 22 for a description of the Record and Playback mixer circuitry.
26. TO CODEC. Connects to the CODEC. When the output of the automixer is plugged in to AMIX IN, the TO CODEC signal is a mix of the AMIX IN and AUX IN signals. This is only needed when you want to add a Playback signal to the automixer output before it is sent to the CODEC. See "Playback/Record" on page 22 for a description of the Record and Playback mixer circuitry.
27. ZONE A. Connects to an audio amplifier or powered loudspeaker in Zone A.
28. ZONE B. Connects to an audio amplifier or powered loudspeaker in Zone B (optional).

How to Get Useful Information from the Signal Level Meters

When configuring the EF1210, it is very important to know which signal level meter to look at. On the front panel, there are two signal level meters — the INPUT signal level meter and the REMOTE signal level meter. When configuring the input channels (microphones 1-8), use the INPUT signal level meter. When configuring the reference inputs (AEC A and AEC B), use the REMOTE signal level meter.

Take note that unlike a microphone mixer, the signal level meters do not show a total output signal, meaning the EF1210 does not add up, for example, all eight input signal levels and show them on the INPUT signal level meter. Instead, what is shown on the signal level meters is the individual signal level of the input channel or reference.

To display the desired input or reference signal when the EF1210 is in normal operation (not setup mode), press the appropriate SELECT button. Push the REF SELECT button to cycle through the two reference inputs. Push the INPUT SELECT button to cycle through the eight input channels. Use the LEDs on the right side of the front panel as an indicator of which level is displayed on the LED meter. The input channels are indicated by the LEDs labeled CHANNELS 1-8. Reference inputs are indicated by the AEC A or AEC B LED.

If you do not see activity on the signal level meter while a talker is talking, do not immediately assume that the level needs to be turned up. First check to make sure you are looking at the correct input or reference on the signal level meter.

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CONFIGURATION

Configure the DIP Switches

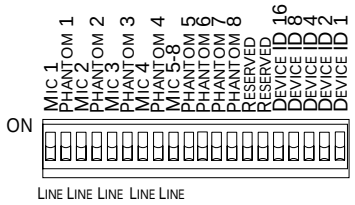

Figure 2. DIP Switches on EF1210 Back Panel

> ***Note.*** *When the DIP switch is down (as shown in the diagram in Figure 2), it is in the OFF position. When the DIP switch is up, it is in the ON position. The default factory setting for all switches is OFF.*

The following is a description of each DIP switch and its function.

SWITCH #	LABEL	FUNCTION
1	MIC 1/LINE	Sets mic or line level for input 1 on the EF1210
2	PHANTOM 1	Sets phantom power for microphone 1. See Caution below.
3	MIC 2/LINE	Sets mic or line level for input 2 on the EF1210.
4	PHANTOM 2	Sets phantom power for microphone 2. See Caution below.
5	MIC 3/LINE	Sets mic or line level for input 3 on the EF1210.
6	PHANTOM 3	Set phantom power for microphone 3. See Caution below.
7	MIC 4/LINE	Sets mic or line level for input 4 on the EF1210.
8	PHANTOM 4	Sets phantom power for microphone 4. See Caution below.
9	MIC 5-8/LINE	Sets microphones 5-8 as a group to accept mic or line level input. This permits any combination of mic and line level inputs by careful selection when connecting cables to inputs. Switch 9 in Line position allows 0-4 microphone inputs; switch 9 in Mic position allows 4-8 microphone inputs.
10	PHANTOM 5	Sets phantom power for microphone 5. See Caution below.

Table 1: DIP Switch configuration

SWITCH #	LABEL	FUNCTION
11	PHANTOM 6	Sets phantom power for microphone 6. See Caution below.
12	PHANTOM 7	Sets phantom power for microphone 7. See Caution below.
13	PHANTOM 8	Sets phantom power for microphone 8. See Caution below.
14	RESERVED	Reserved and must always be set to the OFF position
15	RESERVED	Reserved and must always be set to the OFF position
16	DEVICE ID 16	See Table 2 on page 17
17	DEVICE ID 8	See Table 2 on page 17
18	DEVICE ID 4	See Table 2 on page 17
19	DEVICE ID 2	See Table 2 on page 17
20	DEVICE ID 1	See Table 2 on page 17

Table 1: DIP Switch configuration

Caution! ***Phantom power should be turned OFF unless you are using a microphone that requires phantom power.***

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Device ID

These switches set the Device ID for the EF1210. The ID can be any number from 0 to 31. It is a five bit binary number, with the least significant bit on switch 20. The number after the "Device ID" label denotes the binary value of the switch. Table 2 lists the DIP switch positions necessary to set each Device ID number from 0 to 31.

The Device ID is the same ID that is used with the EF1210 Command Set. The EF1210 will respond only to commands that are sent with the same Device ID as the one set on its switches. If you set the Device ID to one that doesn't agree with your remote control commands, the remote control will no longer affect that particular EF1210.

If you are not using a remote control device (via RS-232 or the ASPI Bus), the Device ID settings do not matter. The default Device ID is 0.

Table 2: DIP Switch Positions for EF1210 Device IDs (**Blank spaces mean switch is OFF**)

Device ID	Switch 16 (Device ID 16)	Switch 17 (Device ID 8)	Switch 18 (Device ID 4)	Switch 19 (Device ID 2)	Switch 20 (Device ID 1)
0 (default)					
1					ON
2				ON	
3				ON	ON
4			ON		
5			ON		ON
6			ON	ON	
7			ON	ON	ON
8		ON			
9		ON			ON
10		ON		ON	
11		ON		ON	ON
12		ON	ON		
13		ON	ON		ON
14		ON	ON	ON	
15		ON	ON	ON	ON
16	ON				
17	ON				ON
18	ON			ON	
19	ON			ON	ON
20	ON		ON		
21	ON		ON		ON

Device ID	Switch 16 (Device ID 16)	Switch 17 (Device ID 8)	Switch 18 (Device ID 4)	Switch 19 (Device ID 2)	Switch 20 (Device ID 1)
22	ON		ON	ON	
23	ON		ON	ON	ON
24	ON	ON			
25	ON	ON			ON
26	ON	ON		ON	
27	ON	ON		ON	ON
28	ON	ON	ON		
29	ON	ON	ON		ON
30	ON	ON	ON	ON	
31	ON	ON	ON	ON	ON

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CONNECTING THE EF1210 TO OTHER EQUIPMENT

Overview

Each AEC input channel must be associated with 4 signals: local input, local output, remote input and remote output. The local input can either be a microphone or line level input. Since the inputs are typically connected to microphones, the inputs will be referred to as microphone inputs in this manual. The local output is the zone output (ZONE A or ZONE B). Remote input is the reference input (AEC A or AEC B) and the remote output is the LINE OUTPUT.

Caution! ***Set mixer inputs to 0 dBu line level, phantom power OFF.***

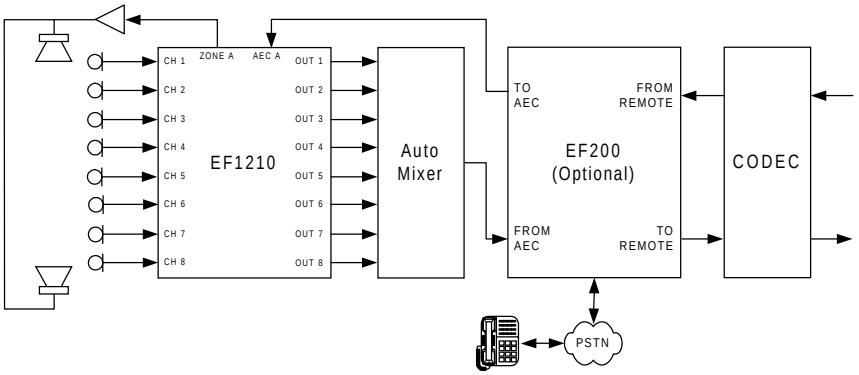

Figure 3. Single room using an EF1210 (single zone).

Zoning

The EF1210 may be configured to work with a single AEC reference input or with two distinct AEC reference inputs. If a single reference is used, the two zone outputs (Zone A and Zone B) will carry the same signal, and either or both of them may be connected to room audio amplifiers. An example of using a single reference on the EF1210 is shown in Figure 3 on page 19. If two references are used, two distinct zone output signals will be generated, one (Zone A) corresponding to Reference A (AEC A) and the other (Zone B) corresponding to Reference B (AEC B). These may, for example, feed room audio amplifiers in two acoustically isolated areas or rooms. Each input channel must be associated with exactly one of the two references. By default, all channels are associated with AEC A. If two references are used, some microphone input channels will in the soundfield of ZONE A and must therefore be associated with Reference A (AEC A), while other microphone input channels will lie in the soundfield of ZONE B and must therefore be associated with Reference B (AEC B). See Figure 4 on page 20 for a block diagram of using a single EF1210 with two references and zones.

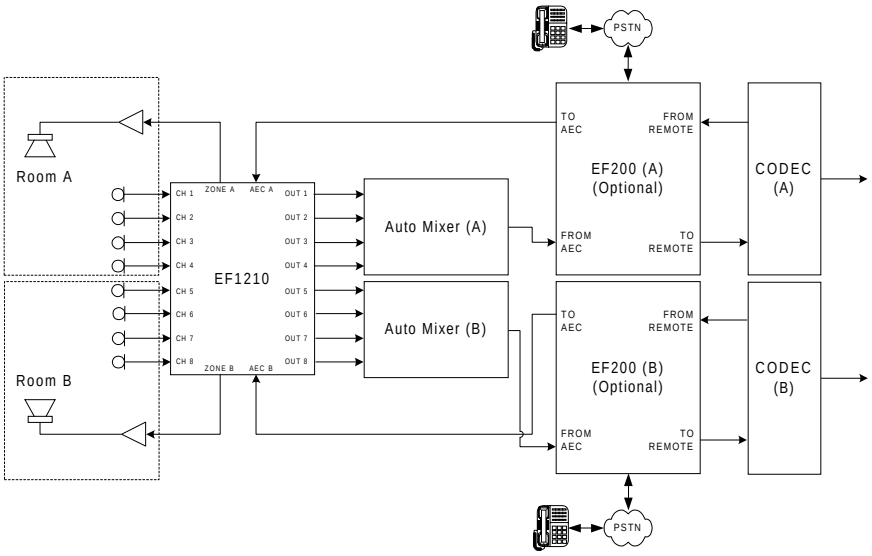

Figure 4. Two independent rooms using a single EF1210

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Typical EF1210 Connections

The EF1210 will typically be connected to other equipment in a single zone setup as shown below in Figure 5.

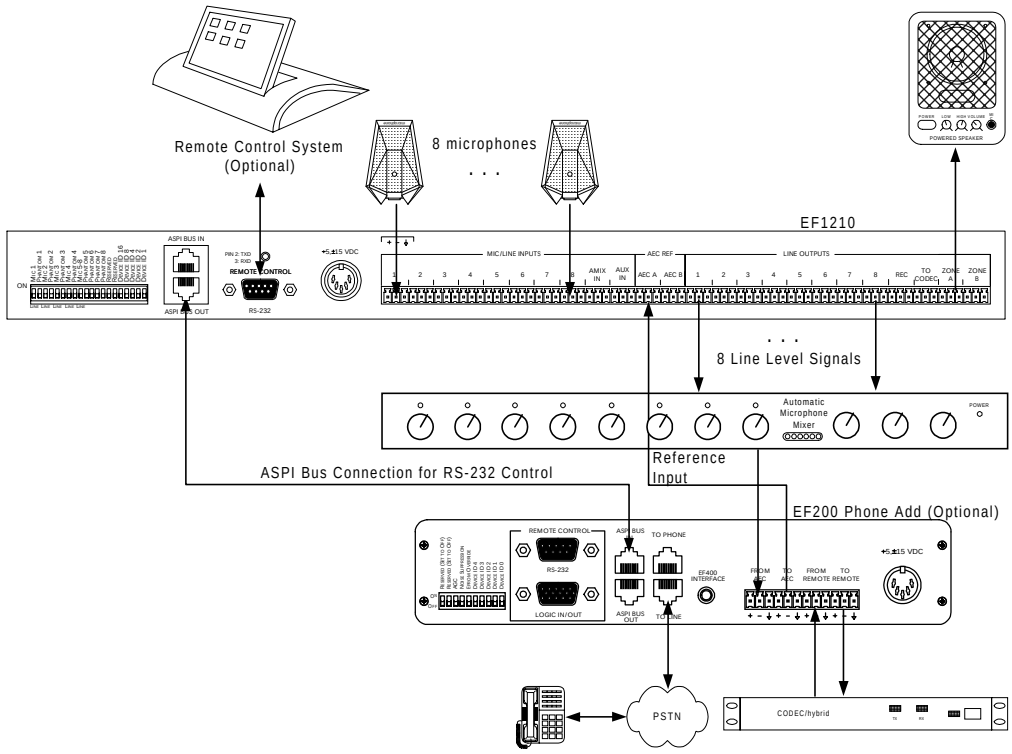

Figure 5. Typical EF1210 Connections

- Connect each of the 8 MIC/LINE INPUTS to a microphone. The MIC/LINE INPUT accepts mini-Phoenix connectors. See "Connector Pinouts" on page 88 for pinouts.
- Connect each of the 8 LINE OUTPUTS to the inputs of an automixer or matrix mixer. Each LINE OUTPUT uses a mini-Phoenix connector.

Caution! ***Set mixer inputs to 0 dBu line level, phantom power OFF.***

- Connect the zone output (ZONE A or ZONE B) to an amplifier or powered loudspeaker.
- Connect the reference input (AEC A or AEC B) to TO AEC on the EF200 (connect only one reference per EF200) or to the output of the CODEC.
- Connect the output of your automixer to FROM AEC on the EF200 or to the input of your CODEC.
- If RS-232 remote control is desired, connect the RS-232 REMOTE CONTROL port of the EF1210 to the remote control device, such as an RS-232 interface to a touch panel or a COM port on a personal computer. Connect the ASPI BUS OUT on the EF1210 to the ASPI BUS IN on the EF200, if you are using an EF200

Phone Add.

> ***Note.*** *The external RS-232 control device may be connected to any ASPI device to control all ASPI devices that are linked via the ASPI Bus.*

- Connect the external power supply to the POWER SUPPLY INPUT jack of the EF1210.

Playback/Record

The EF1210 provides the capability to record and play back audio to your conference. Playback allows you to play the audio output of an external device, such as a television or VCR, to the conference. Record allows you to record the audio of the conference to an external device, such as a tape recorder.

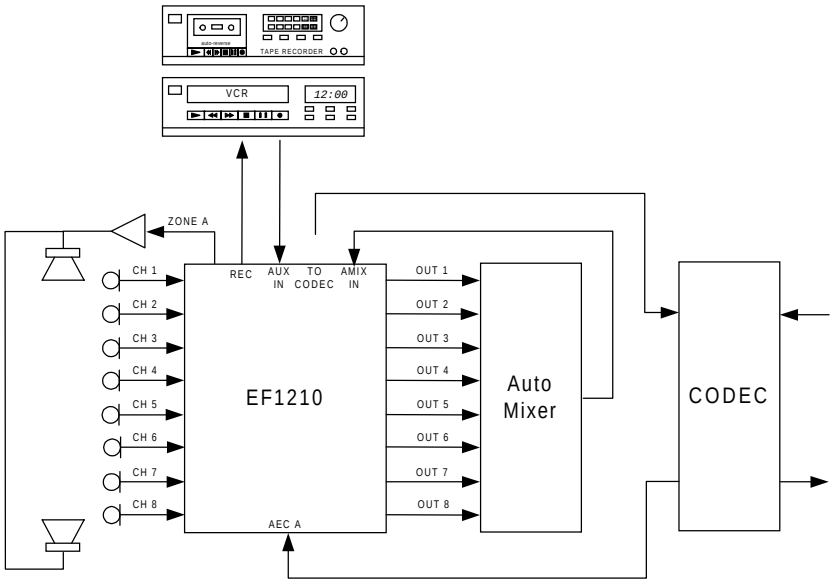

Figure 6. Block diagram of record and playback connections with the EF1210.

To implement the playback function with the EF1210, a playback signal must be added to both the local audio (Zone) output and the remote output (the signal sent to the CODEC or other terminal communication device). To implement the record function, both the local audio and the remote CODEC signal must be mixed and output to a recording device. Since the remote output will normally be produced by an automixer external to the EF1210, the output of the automixer must be available to be mixed with the REC and AUX IN signals. This mixing may be implemented using an external matrix mixer if available, or using the internal mixers provided in the EF1210. In addition to the convenience of using the EF1210 mixers, the EF1210 provides remote control of the level of the AUX IN signal so that weak recordings may be boosted to be audible at both ends.

To use the EF1210 Playback mixer, the output of the automixer must be brought in to the AMIX IN input on the EF1210, and the input to the CODEC (or other remote terminal device) must be taken from the TO CODEC output of the EF1210. The AUX IN input on the EF1210 will be added internally to the TO CODEC signal, and also to the ZONE A output.

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To use the internal EF1210 Record mixer, the output of the automixer must be brought in to the AMIX IN input on the EF1210. The input to the CODEC can come from the automixer output as well or may be taken from the TO CODEC output of the EF1210. The REC output will carry a mix of the AMIX IN and the AEC A signals.

Alternatively, you can do this mixing externally (connect playback output of external program audio device to an automixer input). If record and playback signals are generated using an external mixer, the AUX IN and AMIX IN inputs and the REC and TO CODEC outputs will not be used on the EF1210.

> ***Note.*** *If the EF1210 AUX IN is not used, the playback signal should be mixed with the AEC Reference signal rather than with the Zone output signal for local playback.*

Playback and record are only available with the Reference A (AEC A) and Zone A signals. If two zones are used, playback will NOT function properly in Zone B because it will only be added to Reference A input signal from the far-end.

Using playback and record in the second zone of a multi-zone system will require using the matrix mixer to create appropriate mixes outside of the EF1210.

See Figure 7 on page 23 below for the interconnection of AUX IN and REC input and output, respectively.

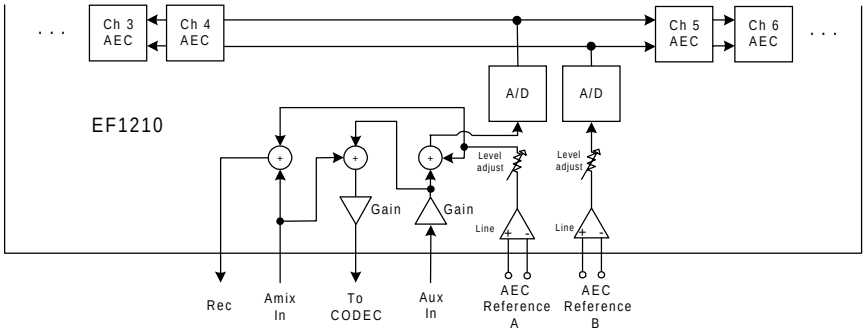

Figure 7. Playback and Record in the EF1210

To record,

- Connect the REC output of the EF1210 to the audio input on the recording device.
- Connect AMIX IN to the output of the automixer or matrix mixer.
- Connect TO CODEC to FROM AEC on the EF200 or the input of the CODEC.

For playback,

- Connect the AUX IN of the EF1210 to the audio output of the playback device.
- Connect AMIX IN to the output of the automixer or matrix mixer.

- Connect TO CODEC to FROM AEC on the EF200 or the input of the CODEC.

Note. *When using the internal EF1210 Record and Play circuitry, a signal being played back will NOT be recorded to avoid the potential of a feedback loop caused by the record/playback device.*

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Figure 8 on page 25 depicts connections on the EF1210 for record and playback.

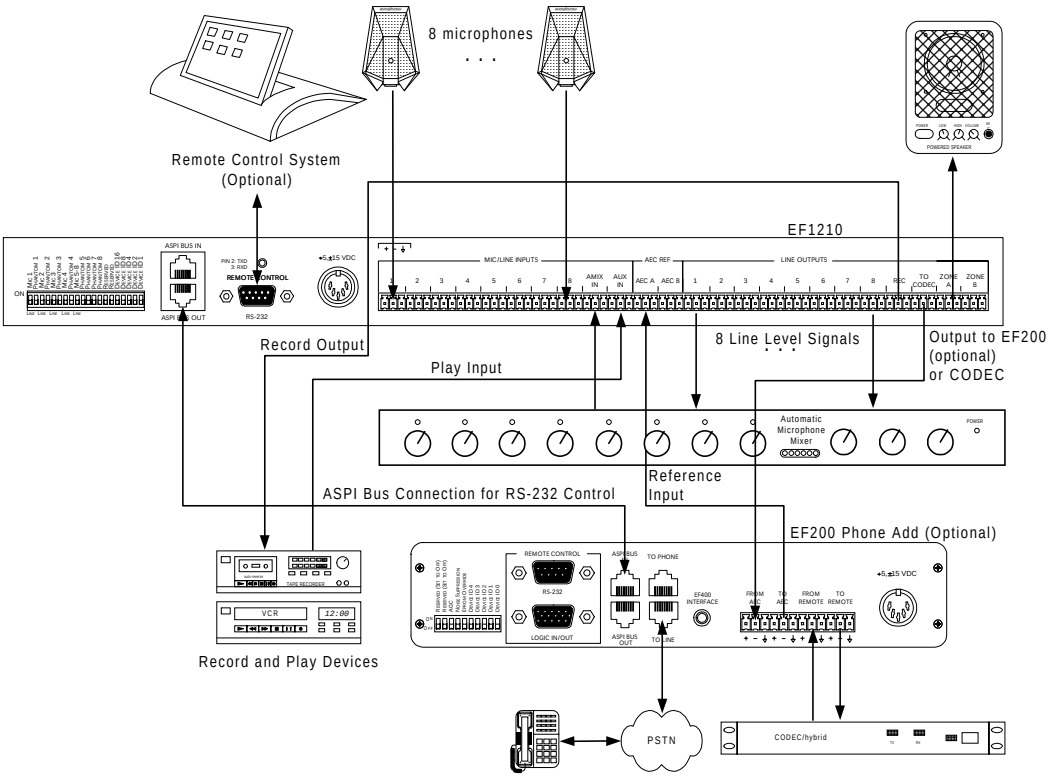

Figure 8. EF1210 Connections for Record and Playback

Connecting Multiple EF1210s

Multiple EF1210s can be easily connected together to add more zones or microphones to your setup. The ASPI Bus allows multiple devices to be controlled by a single RS-232 connection. Reference signals to each EF1210 must still be wired to each EF1210.

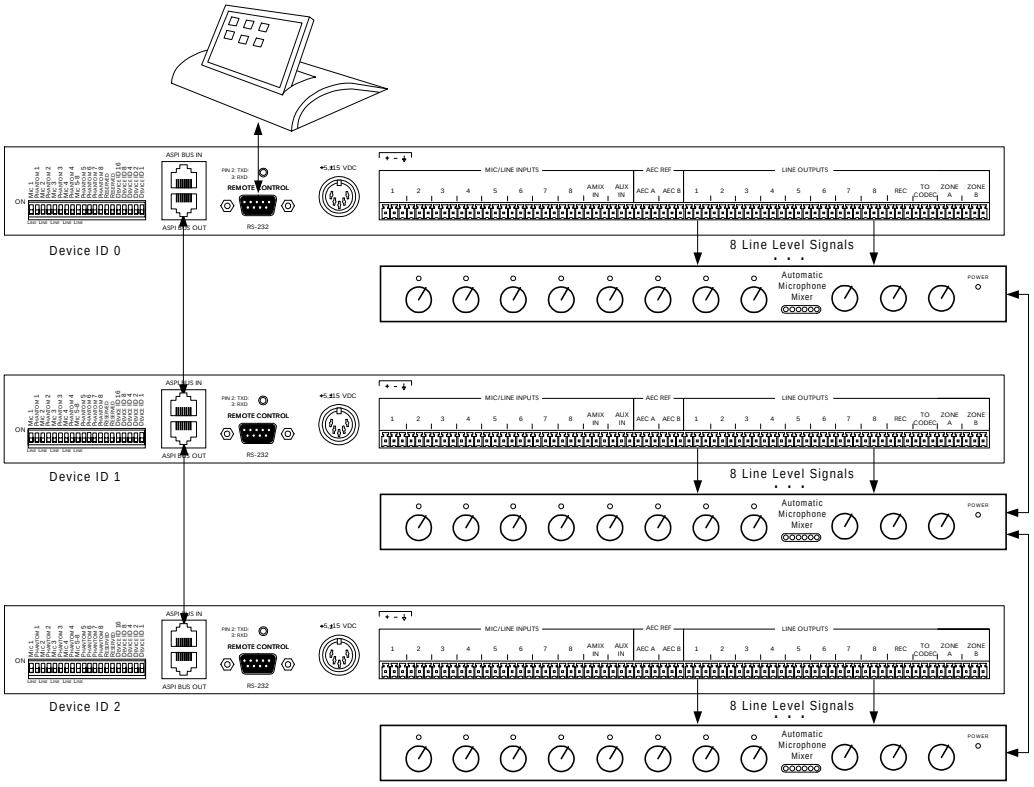

Figure 9. Connecting multiple EF1210s

> ***Note.*** *The Device ID of each EF1210 should be different from other EF1210s connected together.*

Connecting the ASPI Bus

The ASPI Bus can connect multiple ASPI Digital products, such as the EF1210, to the same RS-232 remote control device. This means only one RS-232 connection is needed to control all devices on the ASPI Bus. Each device on the ASPI Bus should have a different Device ID or Type ID, so that each device can be addressed and controlled individually. Note that each different type of ASPI Digital product (e.g. EF200, EF1210) has a distinct Device Type. This means, for example, that an EF200 may have the same Device ID as an EF1210 without causing a conflict. These steps should be followed to connect the ASPI Bus:

1. Connect the RS-232 remote control device to the first ASPI Digital product in the chain.
2. Connect an ASPI Bus cable between the ASPI BUS OUT of the first device, and the ASPI BUS IN of the second device.
3. Connect an ASPI Bus cable between the ASPI BUS OUT of the second device, and the ASPI BUS IN of the third device, and so on.

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CALIBRATION

For the EF1210 to work effectively, it must be calibrated properly to receive correct levels from the surrounding equipment, such as microphones, amplifier, and CODEC. The calibration procedure is required only to adjust the EF1210 to accommodate the electrical characteristics of your conferencing equipment. The procedure allows you to connect the widest possible variety of equipment to your EF1210. It does not train the AEC. The EF1210 does not require training.

In calibration mode, the EF1210 generates a precise noise signal for measuring the characteristics and sensitivity of the microphone. You only need to perform this calibration at the initial installation. You **do not** have to calibrate the EF1210 each time it is used.

> ***Note.*** *When calibrated for the particular microphone and CODEC setup, the EF1210 will provide years of service without recalibration. If the signal levels are not calibrated, the performance of the EF1210 will not be satisfactory. When the signal levels are calibrated correctly, the EF1210 easily and automatically handles any type of signals and changes in room acoustics to provide unparalleled echo cancellation performance.*

> ***Note.*** *If you decide to use a different kind of microphone once the EF1210 has been calibrated, the microphone inputs on the EF1210 will be need to be recalibrated.*

Calibration Steps

- Calibration Step 1: Calibrating Microphone Input Channels (page 29)
- Calibration Step 2: Calibrating Zone Outputs, Check Acoustic Gain (page 30)
- Calibration Step 3: Calibrating AEC Reference Inputs (page 32)
- Calibration Step 4: Calibrating for Playback and Record (page 33). This step may be skipped if you are not using playback and record on the EF1210.
- Calibration Step 5: Zone/Reference Setup (page 34)

Acoustic Gain

Acoustic gain is the maximum amplification that may be applied to a room's audio before being picked up by the microphone(s). The volume control may be set at a lower level than this maximum amplification, but must not be set higher. Too much acoustic gain occurs if the loudspeaker volume going into the microphone is louder than the local talker's volume. This may happen as a result of a combination of the following setups: the loudspeaker volume is turned up too much, the microphone level is too high, the microphone is too close to the loudspeaker, or the talker is not talking close enough to the microphone relative to the loudspeaker volume. Acoustic gain is commonly misunderstood, so when the audio in a room is not loud enough, it seems logical to turn up the volume on the amplifier or loudspeaker. This is often not the best remedy. For example, it may be necessary to turn up the reference input level instead. Breaking through the acoustic gain threshold can cause echoes and howling as loudspeaker levels overpower the microphones.

The calibration procedure will outline how to associate a volume level with the acoustic gain of a room. Refer to "Check Acoustic Gain" on page 31.

Two Methods of Calibration

The EF1210 can be calibrated two ways: calibrating with a computer or without. We recommend using a computer for calibration because it is an easier procedure and it is more precise. If you have a computer, please refer to our on-line document for computer calibration procedures. See “Calibrating With a Computer” below for our web address. If you do not have a computer, please refer to ““Calibrating Without a Computer” on page 28” for front panel setup.

CALIBRATING WITH A COMPUTER

Included in your shipment of the EF1210 is a diskette containing the EFPanel Control Software and a PDF version of the EFPanel User Manual, which includes installation instructions. Install EFPanel and use it to calibrate the EF1210 with a computer. Also included is a hardcopy of this manual. This control software and manual may be changed and updated periodically, so please visit our website at http://www.aspi.com for the most recent versions.

CALIBRATING WITHOUT A COMPUTER

In Calibration mode, the SETUP LED will blink to let you know which setup step you are currently executing. The different modes are shown in Table 3 below. Press the AUX IN LEVEL/SETUP button to move from one Calibration step to the next. When you have finished Calibration Step 5, press the AUX IN LEVEL/SETUP button again to exit Calibration mode; any changes that you made will be saved as the default power-on settings when you exit the Calibration procedure.

If you miss a Calibration step or lose your place and get to the wrong Calibration step, you may either continue and come back to the missed step later or exit Calibration mode (by pressing AUX IN LEVEL/SETUP button repeatedly until the SETUP LED is no longer illuminated), re-enter Calibration mode, and resume Calibration at the step that you missed. If you wish to exit Calibration mode and discard any changes that you made, you must cycle power on the EF1210 before exiting Calibration mode.

Figure 10. Legend for calibration drawings.

CALIBRATION MODE	SETUP
MIC Input Calibration	SETUP LED blinks once per period
ZONE Output Calibration	SETUP LED blinks twice per period
AEC REF Input Calibration	SETUP LED blinks three times per period
Calibrating for Playback and Record	SETUP LED blinks four times per period
Zone/Reference Setup	SETUP LED blinks five times per period

Table 3: Visual indication of calibration mode.

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Note. *One period equals the number of blinks per step plus one off-time.*

CALIBRATION STEP 1: CALIBRATING MICROPHONE INPUT CHANNELS

1.1. Press and hold the AUX IN LEVEL/SETUP button **and** the INPUT SELECT button for two seconds to enter configuration mode of the EF1210. For Calibration Step 1, the SETUP LED will blink once per period. For this step you will need a Sound Level Meter (SPL Meter).

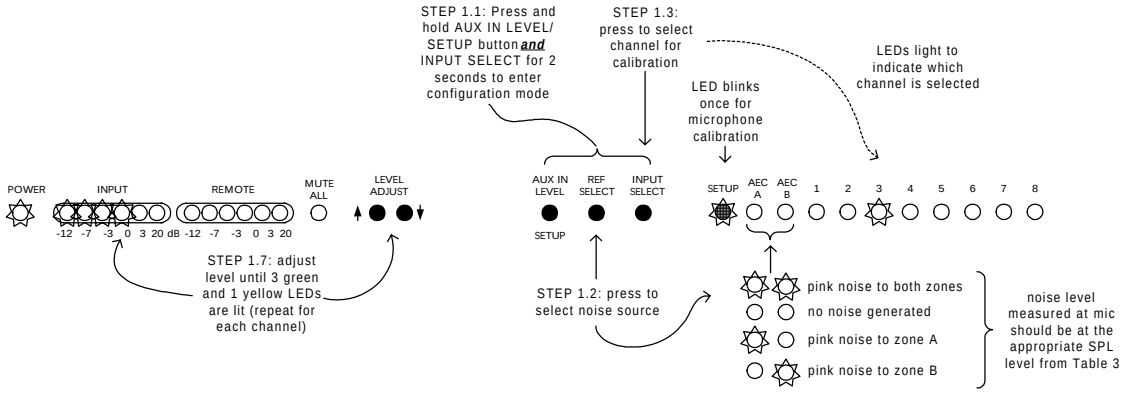
STEP 1.1: Press and hold AUX IN LEVEL/ SETUP button and INPUT SELECT for 2 seconds to enter configuration mode
STEP 1.3: press to select channel for calibration
LEDs light to indicate which channel is selected
LED blinks once for microphone calibration
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 1.7: adjust level until 3 green and 1 yellow LEDs are lit (repeat for each channel)
STEP 1.2: press to select noise source
pink noise to both zones
no noise generated
pink noise to zone A
pink noise to zone B
noise level measured at mic should be at the appropriate SPL level from Table 3

Figure 11. Calibrating Mic Inputs

1.2. If necessary, press the REF SELECT button to select which zone the pink noise is being played in.
- When you first enter configuration mode, pink noise is played in both Zone A and Zone B.
- Press REF SELECT for no pink noise in Zone A or Zone B.
- Press REF SELECT again for pink noise in Zone A.
- Press REF SELECT again for pink noise in Zone B.
- Repeated pressing of REF SELECT will cycle through these four modes. See Figure 11 on page 29.

1.3. Press the INPUT SELECT button to choose the input channel.

1.4. Set the SPL meter (Sound Level Meter) to C weighted, slow response. Choose the appropriate dB SPL range using Table 4 below based on microphone type and the talker's distance from the microphone.

MICROPHONE TYPE	TYPICAL DISTANCE FROM TALKER (FT.)	SPL LEVEL (dB)
Lavalier	6 inches to 1 foot	89 dB SPL
Gooseneck	1-2 feet	77 dB SPL
Boundary or other tabletop	2-3 feet	73 dB SPL
Ceiling	4 or more feet	69 dB SPL

Table 4: Typical distance from microphone to talker and appropriate dB SPL level.

1.5. Place the SPL meter beside the microphone. Point the SPL meter and the micro-

phone toward the loudspeaker.

> ***Note.*** *It is vital to move the SPL meter and/or microphones so that each microphone sees the correct dB SPL acoustic level as you are calibrating. Do not assume that because the first microphone sees the dB SPL level, all other microphones will see the same level (unless they are moved to occupy the same location as the first).*

1.6. Adjust the loudspeaker volume so that a nominal dB SPL level based on Table 4 is registered at the microphone.

> ***Note.*** *Always double check the microphone level with normal speech once the microphones are in normal operating position. Actual speech levels may vary depending on room reverberation, etc. Verify that you set a reasonable level (three green LEDs and one solid yellow LED, or 0 dB) by actually talking and looking at the meter.*

1.7. Use the LEVEL ADJUST buttons to adjust the channel input gain until 3 green and 1 yellow (or 0 dB) LED are lit on the INPUT SIGNAL LEVEL METER.
1.8. Repeat steps 3 - 7 for all input channels.
1.9. Return all microphones to their normal operating location and orientation.

> ***Note.*** *Use caution if the microphones lie in two acoustically separated zones and you are only calibrating one zone. As you cycle through microphones that lie in the other zone, no activity will be indicated on the INPUT SIGNAL LEVEL METER.*

CALIBRATION STEP 2: CALIBRATING ZONE OUTPUTS

2.1. Once all input channels have been calibrated, press the AUX IN LEVEL/SETUP button again to switch to Zone Output calibration. For Calibration Step 2, the SETUP LED will blink twice per period.

This step sets the nominal output level of the Zone Outputs to match your room audio equipment. This step also lets you mark the maximum room loudspeaker amplification level permissible without violating the room acoustic gain limit.

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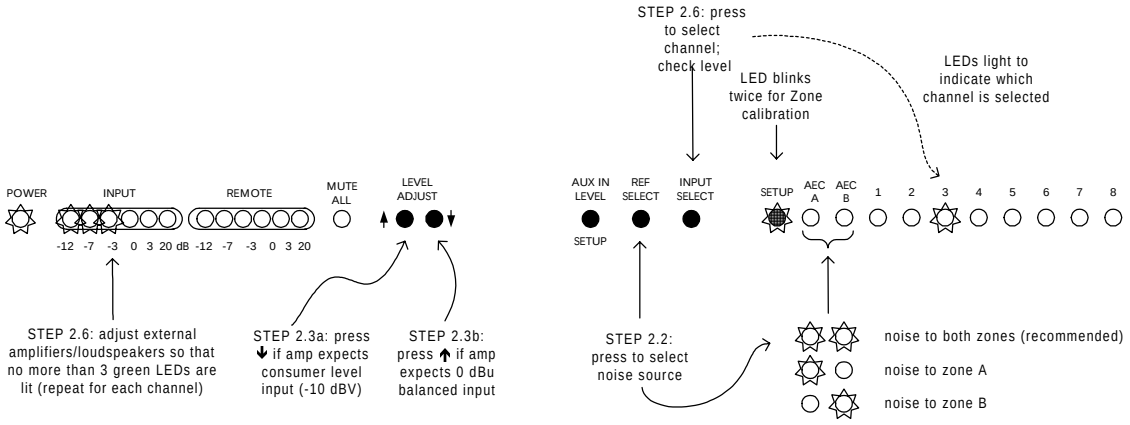
STEP 2.6: press to select channel; check level
LED blinks twice for Zone calibration
LEDs light to indicate which channel is selected
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 2.6: adjust external amplifiers/loudspeakers so that no more than 3 green LEDs are lit (repeat for each channel)
STEP 2.3a: press ↓ if amp expects consumer level input (-10 dBV)
STEP 2.3b: press ↑ if amp expects 0 dBu balanced input
STEP 2.2: press to select noise source
noise to both zones (recommended)
noise to zone A
noise to zone B

Figure 12. Calibrating Zone outputs

2.2. Press the REF SELECT button to choose which output is being calibrated. A nominal level noise signal is played through the selected Zone output(s).
- When the EF1210 first enters Zone Output calibration, the AEC A and AEC B LEDs are lit, indicating that both zones will be calibrated. Use this if you want to calibrate both zones at the same time.
- If you want to calibrate only Zone A, press the REF SELECT button to select Zone A. Only the AEC A LED lights, indicating Zone A.
- If you want to calibrate only Zone B, press the REF SELECT button again to select Zone B. Only the AEC B LED lights, indicating Zone B.

2.3. Check the specifications of your room audio amplifier input:
- If it expects consumer level (-10 dBV) input, press the LEVEL ADJUST DOWN button once.
- If it has a balanced input connector and expects 0 dBu input level, press the LEVEL ADJUST UP button once.

More precise level adjustments can be made with the RS-232 commands (see the `GAINZ` command on page 68 of the Command Set Reference.

2.4. If you selected only one of the Zone Outputs, repeat for the second Zone Output.

For visual instructions, refer to Figure 12 on page 31.

Check Acoustic Gain.

2.5. At this point you are ready to calibrate the absolute maximum room audio amplification level. For this step, you should ensure that the microphones have been returned to their normal operating location and orientation. This procedure uses a known nominal electrical noise signal level at the zone output to let you see if any of the microphone input channels will exceed the permissible acoustic gain during normal conferencing operation. The level of this noise signal is such that if any microphone input channel registers more than three green LEDs on the EF1210 INPUT SIGNAL LEVEL METER, the acoustic gain limit of that microphone channel has been reached. This represents the maximum amplification that may be applied to the room audio. The room audio may be run at any level below this threshold, but should not be amplified beyond this level unless the acoustic gain is reduced by some other means (See “Acoustic Gain” on page 44).

All microphones should be checked in this step as verification that no microphone inputs or zone outputs have been miscalibrated.

As above, both Zones can be adjusted at the same time (both AEC A and AEC B LEDs will be lit indicating Zone A and Zone B). This is recommended because you can check all Input Channels at the same time. Alternatively, if necessary, you may select either Zone by pressing REF SELECT until the appropriate AEC LED is lit and check one Zone at a time.

> ***Note.*** *You should start by selecting (using the* INPUT SELECT *button) and checking the microphone input channel which is closest to the loudspeakers or the microphone which might be expected to pick up the most acoustic energy from the loudspeaker audio, as appropriate. Check the acoustic gain of this microphone using Step 5, then quickly step through each of the microphone channels (step 6) to verify that no other microphone has a stronger signal.*

Adjust the external room audio amplifiers/loudspeakers until either:

- The loudspeaker audio level is about to become uncomfortably loud.

OR

- Three green LEDs on the EF1210 INPUT SIGNAL LEVEL METER are lit, but the first yellow (0 dB) LED is not lit for the chosen input channel

2.6. Next, step through the microphone input channels by pressing the INPUT SELECT button, while verifying for each channel that the first yellow (0 dB) LED is not lit on the INPUT SIGNAL LEVEL METER.

- If the first yellow (0 dB) LED is lit for any channel, turn down the room audio amplifier on the corresponding Zone Output or turn down the gain on that microphone channel.

> ***Note.*** *Do not turn up the room audio level at any point after Step 5.*

2.7. When all input channels have been checked, you can mark the positions of the volume controls on the room audio amplifiers and note that this is the absolute maximum amplification that may be applied to room audio. This maximum amplification will be referred to in this manual as the amplifier acoustic gain limit.

> ***Note.*** *The volume control may be set at a lower level than this marked position (amplifier acoustic gain limit), but must not be set higher or the performance of the echo canceller will be suboptimal.*

During normal operation, the zone output levels will be set 6 dB lower than the selected level (amplifier acoustic gain limit) to allow the EF1210 LEVEL ADJUST controls to apply a volume adjustment to the room audio signal in the range +6 dB to -12 dB.

Refer to Figure 12 on page 31 for further explanation.

CALIBRATION STEP 3: CALIBRATING AEC REFERENCE INPUTS

3.1. Once the Zone Output channels and room audio amplifier have been calibrated, press the AUX IN LEVEL/SETUP button again to switch to AEC Reference Input

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calibration. For Calibration Step 3, the SETUP LED will blink three times per period.

For this step, you will need a live connection to a remote conferencing site (or two sites if you are configuring the EF1210 for two AEC reference inputs).

- If you are configuring the EF1210 for operation with one AEC reference input, you will calibrate the AEC A signal.
- If you are configuring the EF1210 for operation with two AEC reference inputs, you will calibrate both the AEC A and the AEC B signals.

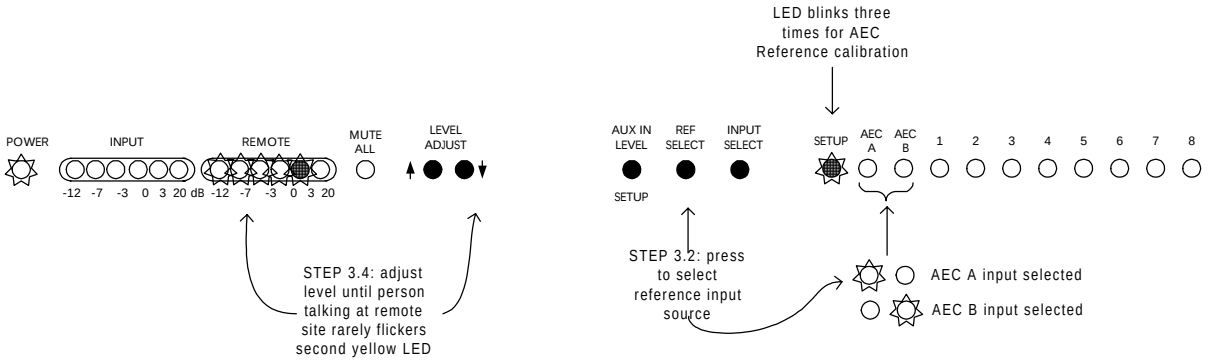
LED blinks three times for AEC Reference calibration
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
SETUP
STEP 3.4: adjust level until person talking at remote site rarely flickers second yellow LED
STEP 3.2: press to select reference input source
AEC A input selected
AEC B input selected

Figure 13. Calibrating AEC Reference Inputs

3.2. Press REF SELECT to select between AEC A and AEC B. This will be indicated by the front panel AEC A and AEC B LEDs. During this step, all other LEDs (INPUT CHANNEL) will be extinguished.
3.3. Have the person at the remote end of the conferencing link sit at a normal distance from a microphone and talk at a normal level while you observe the signal activity on the REMOTE SIGNAL LEVEL METER.
3.4. Adjust the AEC Reference Input by pressing the LEVEL ADJUST buttons until the first yellow (0 dB) LED lights regularly during normal speech at the remote end, and the second yellow LED flickers occasionally.
3.5. If you are calibrating two AEC Reference Inputs, switch to the other by pressing REF SELECT and repeat the calibration for the second reference signal.

Caution! ***If you skip this calibration step, you will compromise the performance of the EF1210. The audio coming from the remote end may be too low, so if you turn up the loudspeaker to compensate, the acoustic gain will be affected.***

Refer to Figure 13 on page 33.

CALIBRATION STEP 4: CALIBRATING FOR PLAYBACK AND RECORD

4.1. Once the AEC Reference Inputs have been calibrated, press AUX IN LEVEL/ SETUP again to switch to Playback/Record calibration. For Calibration Step 4, the SETUP LED will blink four times per period. This step calibrates the TO

CODEC signal. No other calibration is necessary for Playback/Record.

The TO CODEC signal may be adjusted to match the level required by your codec (or other remote terminal equipment) input.

> ***Note.*** *You may skip this step if you are not using playback and record on the EF1210*

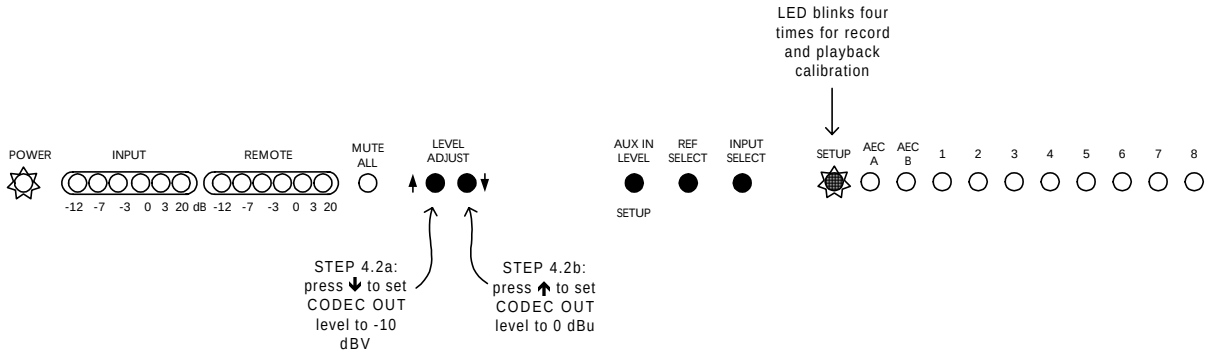
LED blinks four times for record and playback calibration
POWER
INPUT
REMOTE
MUTE ALL
LEVEL ADJUST
-12 -7 -3 0 3 20 dB -12 -7 -3 0 3 20
AUX IN LEVEL
REF SELECT
INPUT SELECT
SETUP
SETUP
AEC A
AEC B
1 2 3 4 5 6 7 8
STEP 4.2a: press ↓ to set CODEC OUT level to -10 dBV
STEP 4.2b: press ↑ to set CODEC OUT level to 0 dBu

Figure 14. Calibrating for playback and record.

4.2. Press the LEVEL ADJUST DOWN button to set the TO CODEC level to -10 dBV. Press the LEVEL ADJUST UP button to set the TO CODEC level to 0dBu. More precise level adjustments can be made with RS-232 commands (See the `GAINC` command on page 62 in the Command Set Reference.).

Refer to Figure 14 on page 34.

CALIBRATION STEP 5: ZONE/REFERENCE SETUP

5.1. Enter Zone/Reference Setup mode by pressing AUX IN LEVEL/SETUP after stepping through the normal configuration sequence. For Calibration Step 5, the SETUP LED will blink five times per period.

If you are only using a single zone, you may omit this step.

During Calibration Step 5, you may set the EF1210 to use different AEC Reference Inputs for each channel. The reference signal used with channel 1 will be used as Zone A output, and the reference used with channel 8 will be used as Zone B output. Microphones on the input channels must be placed in the sound field of the appropriate Zone output for the EF1210 to operate correctly; otherwise echoes will not be cancelled. In other words, if for example the microphone on channel 3 is in the soundfield of the loudspeaker connected to the Zone B out-

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put, channel 3 must be configured to use Reference B (AEC B) as its reference.

> ***Note.*** *If you are using only one reference signal (Reference A), all microphones must be configured to use that reference signal. If you are using two reference signals (Reference A and Reference B), Input Channel 1 must be associated with Reference A (AEC A) and Input Channel 8 must be associated with Reference B (AEC B). The other 6 microphones can be associated with either reference.*

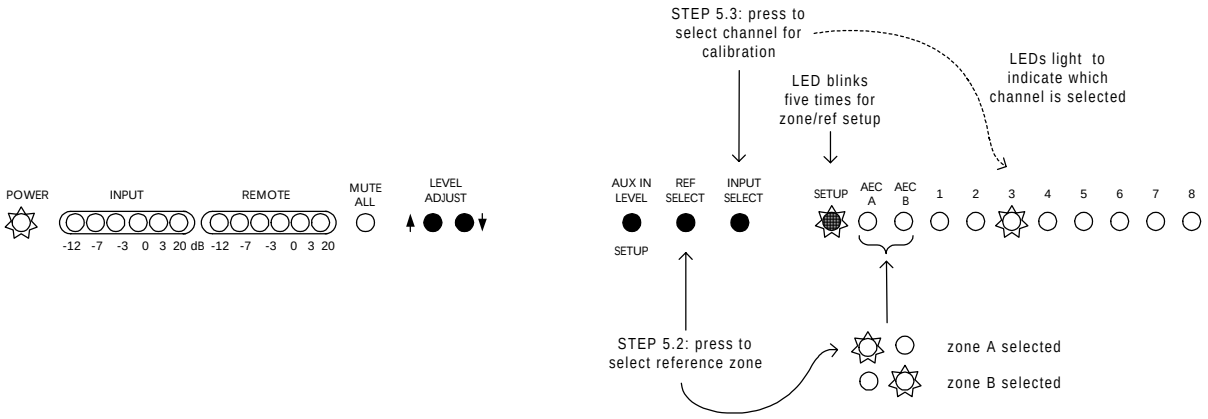

Figure 15. Zone/Reference Setup

5.2. Use the REF SELECT button to select an AEC Reference (AEC A or AEC B) to be used with the channel indicated by the Input channel LEDs. The AEC A or AEC B LED will illuminate to indicate the selected reference.

5.3. Press the INPUT SELECT button to select the next input channel, and select AEC A or AEC B as reference for that channel. Continue until all eight input channels have been configured.

5.4. You may now exit configuration mode and resume normal operation by pressing the AUX IN LEVEL/SETUP button.

Refer to Figure 15 on page 35.

> ***Note.*** *Once you enter setup from the front panel, the configuration will be saved as the power-on default once you exit setup. If you wish to discard any changes you made, you must cycle power on the EF1210 before you press the SETUP button to exit Setup.*

MOUNTING THE EF1210

The EF1210 can be mounted in a rack enclosure using four large screws (10-32 x 1/2") included with the unit. One EF1210 fits in a single rack space.

Recommendation For Easy Access

While not required, it is prudent to leave a single rack space in between the EF1210 and other units in your rack. This not only is a good design practice, but also gives you easier access to the backpanel. If you cannot leave a single rack space, mount the EF1210 **below** units that are longer in length so that you can access the Phoenix connectors on the backpanel more easily.

Instructions for Securing Power Supply to Back of EF1210

- Locate the cable clamp on the back panel of the EF1210 above the RS-232 port.
- Remove the screw and thread the power cord through the cable clamp.
- Attach the cable clamp to the back panel of the EF1210 and tighten the screw. Align the clamp so that the power cable does not interfere with the connectors on the EF1210 backpanel.
- Plug in the power supply.
- We recommend that you also Ty-wrap the power supply to the rack.

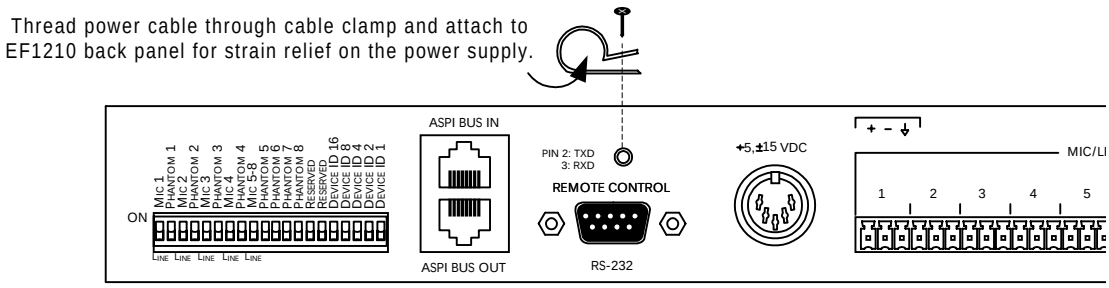

Figure 16. Attaching a cable clamp to the back panel of the EF1210

The purpose of securing the power supply to the back panel is so that if the power supply were to drop, it would pull where the cord is attached with the cable clamp and not pull the plug out of the EF1210.

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Caution! ***Do not use any other power supply other than the one provided with this unit.***

Caution! ***Failure to use all four screws to attach the EF1210 to the rack may result in uneven loading and cause a safety hazard.***

Caution! ***Ensure that the power supply is securely located such that it cannot become dislodged and fall. Such a fall could cause personal injury or equipment failure.***

Caution! ***When mounting an EF1210 in a rack, consideration should be given to airflow and operating ambient temperatures inside the rack. To ensure safe operation of the EF1210, ambient operating temperatures inside the rack should not exceed 50 degrees Celsius. Allow 2 inches of open space in front of the EF1210, two inches on either side, and four inches behind the unit for proper ventilation. Equipment should not be installed in the rack in such a way as to interfere with the ventilation of the EF1210.***

Caution! ***The EF1210 enclosure is designed to maintain a 1/4" clearance above the top of the unit. Do not install or stack EF1210s in such a way as to defeat this clearance.***

Caution! ***Do not block the vents on the sides of the EF1210.***

Caution! ***Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have an overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.***

Caution! ***Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connection to the Branch (use of power strips).***

OPERATING THE EF1210

USING THE EF1210 WITHOUT RS-232 CONTROL

Changing Level Display on INPUT and REMOTE LED Meters

When the EF1210 is in normal operating mode, pushing the INPUT SELECT button will allow you to see levels of each input channel on the INPUT LED meter. The green LED corresponding to an input channel will light if the levels of that channel are currently displayed on the INPUT LED meter. In the same way, pushing the REF SELECT button will allow you to see the levels of each reference input on the REMOTE LED meter. A yellow LED will indicate which reference (AEC A or AEC B) is displayed on the meter.

Adjusting Volume in Zones

The reference LEDs (AEC A or AEC B) do double duty. They not only indicate which Reference Input is currently displayed on the REMOTE LED meter, but also indicate which Zone Output is affected when the LEVEL ADJUST buttons are pressed. The AEC A LED indicates that ZONE A's volume is being adjusted by the LEVEL ADJUST button. The AEC B LED indicates that ZONE B's volume is being adjusted by the LEVEL ADJUST button. The output levels can be adjusted up to 6 dB above and 12 dB below the nominal zone output level. The nominal zone output level is 6 dB below the level selected in Calibration Step 2: Calibrating Zone Outputs.

Adjusting Playback Levels

The AUX IN input and REC output signals are preset to -10 dBV signal levels. The level of the AUX IN signal may be adjusted during normal operation to compensate for low or high audio level from an external playback device.

1. During normal operation, press and hold the AUX IN LEVEL/SETUP button while using the LEVEL ADJUST buttons to adjust the level of the playback signal. The level-adjusted AUX IN signal is mixed with the AMIX IN signal (nominally 0dBu) and sent to the TO CODEC connector. It is also mixed with the AEC A signal and played over the Zone A output.

Muting

To mute channels while using the EF1210 without RS-232 control, for push-to-talk microphones for example, we suggest using the mute control capability on the mixer rather than using a microphone with mute built inside it. The AEC will perform better using this method because it allows the speech to be processed inside the EF1210 before being muted instead of totally cutting off the speech so that the AEC has to readapt when the microphone comes on again.

Splitting zones

Calibrate using calibration procedures. When using more than one zone, refer to "Calibration Step 5: Zone/Reference Setup" on page 34 to associate each microphone input channel with a reference. If you are using two reference signals (Reference A and Reference B), Input Channel 1 must be associated with Reference A (AEC A) and Input Channel 8 must be associated with Reference B (AEC B). The other 6 microphones can be associated with either reference

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USING THE EF1210 WITH RS-232 CONTROL

You can control all of the EF1210's features with an RS-232 remote control device. The instructions below explain which RS-232 commands are needed to accomplish each function. Users may not need to know these commands, since they may be hidden behind the user interface of the remote control device. A full Command Set Reference is provided at the end of this manual starting on page 53.

Serial Port Setup

For RS-232 control, use an RS-232 cable — do not use a null modem. Refer to "Connector Pinouts" on page 88 for pin connections for the RS-232 cable. The RS-232 port on the remote control device should be set to 9600, 8-N-1.

Changing Level Display on INPUT and REMOTE LED Meters

When the EF1210 is in normal operating mode, the input channel level displayed on the INPUT LED meter can be checked and adjusted using the following commands from the RS-232 command set:

Command	Description	Effects
SELECTI*n*	Set front panel INPUT LED meter to display input channel *n*.	The level of input channel *n* will be displayed on the INPUT LED meter and the green LED of the channel will light.
SELECTI?	Request current assignment of front panel INPUT LED meter.	The EF1210 returns channel *n*, which indicates that the front panel INPUT LED meter is currently set to display input channel *n*. *n* ranges from 1 to 8.

When the EF1210 is in normal operating mode, the Reference Input level displayed on the REMOTE LED meter can be checked and adjusted using the following commands from the RS-232 command set::

Command	Description	Effects
SELECTR*c*	Set front panel REMOTE LED meter to display Reference input *c*.	The level of Reference input *c* will be displayed on the REMOTE LED meter and the yellow LED of the reference will light.
SELECTR?	Request current assignment of front panel REMOTE LED meter.	The EF1210 returns Reference input *c* which indicates that the front panel REMOTE LED meter is currently set to display Reference input *c*. *c* is either A or B.

Adjusting Volume in Zones

The volume in the zones can be checked and adjusted using the following commands from the RS-232 command set:

Command	Description	Effects
GAINZ*c*x	Set zone *c* output gain to x.	Zone *c* output gain set to x dB; yellow LED on AEC *c* will light. *c* is either A or B. x ranges from 0 to 20 dB.
GAINZ*c*?	Request zone *c* output gain.	Current gain for zone *c* is returned to remote control device.

> ***Note.*** *See the "GAINZc - set ZONE output gain on output c" on page 68 for a more detailed description of the zone output gain x.*

During normal operation, the zone output levels will be set 6 dB lower than the selected level (amplifier acoustic gain limit) to allow the EF1210 LEVEL ADJUST controls to apply a volume adjustment to the room audio signal in the range +6 dB to -12 dB.

Adjusting Playback Levels

The AUX IN input and REC output signals are preset to -10 dBV signal levels. The level of the AUX IN signal may be adjusted during normal operation to compensate for low audio level from an external playback device. The playback level can be adjusted using the following commands from the RS-232 command set:

Command	Description	Effects
GAINPx	Set playback input gain to x.	Playback input gain set to x dB. x ranges from 0 to 15 dB. The default is 8 dB.
GAINP?	Request playback input gain.	Current gain for playback is returned to remote control device.

> ***Note.*** *See the "GAINP - set PLAYBACK input gain (on AUX IN input)" on page 65 for a more detailed description of the playback input gain x.*

Muting

The channels on the EF1210 can be muted using the RS-232 command set. Using the MUTEI command will mute the outgoing audio on LINE OUTPUT of the channel that is muted. The MUTE ALL LED will light only when all channels are muted.

Command	Description	Effects
MUTEI*n*	Mute channel *n*	Outgoing audio on channel *n* is muted.
MUTEI*	Mute all channels	All channels are muted; the MUTE ALL LED lights.

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Wideband NC vs. AEC mode

Having the option to turn the AEC off for wideband noise cancellation is particularly useful when used in a system that has both conferencing capabilities and sound reinforcement. For this system, we suggest programming the remote control device to turn on the AEC on each channel of the EF1210 if the room is being used for a conference (when the phone or CODEC is connected). At any other time, program the remote control device to turn on wideband noise cancellation for sound reinforcement.

Command	Description	Effects
SR16	Set sample rate to 16 kHz.	The normal operating mode is 16 kHz. In this mode, AEC can be enabled or disabled.
SR48	Set sample rate to 48 kHz.	The wideband mode (48 kHz) is provided for applications that require high-fidelity noise cancellation. In this mode, AEC is disabled.
SR?	Request sample rate.	Current sample rate is returned to remote control device.

Splitting zones

Use EF Panel Control Software to calibrate the EF1210. On Calibration Step 5 when using more than one zone, associate each microphone input channel with either Reference A or Reference B. If you are using two reference signals (Reference A and Reference B), Input Channel 1 must be associated with Reference A (AEC A) and Input Channel 8 must be associated with Reference B (AEC B). The other 6 microphones can be associated with either reference

TROUBLESHOOTING

NO OUTPUT TO LOUDSPEAKERS IN ZONE

You can't hear the remote end.

Check the REMOTE LEVEL INDICATOR of the zone (use the REF SELECT button to switch between Reference A and Reference B. If the LED graph meter shows activity, the EF1210 is receiving a signal. In this case, the problem is between the EF1210 and the loudspeaker.

If there is no activity on the REMOTE LEVEL INDICATOR, the EF1210 is not receiving a signal. In this case, the problem is between the EF1210 and the microphone(s) on the remote end.

Check the CODEC (or EF200) output by connecting it directly to the amplifier or powered speaker. If you hear nothing, the EF1210 is not causing the problem and the source of the problem is elsewhere in the system.

Make sure the CODEC or EF200 is connected to the appropriate reference input (AEC A or AEC B) from the appropriate zone.

Make sure the CODEC or EF200 is turned on.

Make sure everything on the remote end is working properly.

Make sure the cables are not broken. Check the cable pinouts.

If you see signal activity on the REMOTE signal meter, make sure the appropriate zone output (ZONE A or ZONE B) is connected to the amplifier or powered loudspeaker input.

Make sure the amplifier or powered loudspeaker is on and that the volume is at an appropriate level. If the zone output level needs adjusting, choose the appropriate zone by pressing the REF SELECT button on the front panel. The yellow AEC A or AEC B LEDs indicate not only the reference input but also the corresponding zone output.

> **Caution!** ***When adjusting amplifier or powered loudspeaker levels, be careful not to exceed the maximum amplification level that you took note of in the Zone Output calibration (see "Check Acoustic Gain" on page 31).***

NO OUTPUT TO REMOTE END

Remote end can't hear you.

Check each microphone's level on the INPUT LEVEL INDICATOR to make sure there is activity when you speak into the microphone. You can display each microphone's input level by using the INPUT SELECT button to cycle through each microphone. If the INPUT LEVEL INDICATOR shows activity when you speak into the microphone, the EF1210 is receiving the microphone signal. This means the remote end is not receiving a signal from the EF1210.

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Check LINE OUTPUTS by connecting each output to the amplifier or powered loudspeaker in the appropriate zone (turn the loudspeaker down to avoid howling). If the loudspeaker emits sound when you speak into the microphone, the signal is making it through the EF1210. This means there is a problem with the automixer, CODEC, the CODEC connection, or a device on the remote end.

If the INPUT LEVEL INDICATOR does not display activity, the EF1210 is not receiving the microphone signals. This means there is a problem with the microphone.

If the microphones you are using require phantom power, make sure it is enabled on the appropriate channel on the EF1210 DIP switches. Make sure the phantom power voltage is compatible with the microphone.

Make sure the automixer output is connected to the CODEC or EF200 input.

Make sure the CODEC or EF200 is turned on.

Make sure everything on the remote end is working properly.

Make sure the cables are not broken. Check the cable pinouts.

Make sure the microphone is plugged into the appropriate MIC/LINE INPUT.

RESIDUAL ECHO

You may hear residual echo if system levels are not set properly. Improper level settings anywhere in the audio path can introduce nonlinearities that hamper the operation of the EF1210. If you hear residual echo, one of the following conditions may be causing the problem.

Reverberation vs. Echo

Do not confuse the residual echo of remote speech with the reverberation of local speech. Reverberation of local speech is caused when the speech signal arrives at the microphone via several paths (the direct path and multiple reflections from surfaces in the room). This is a local room phenomenon that gives the talker's voice a hollow or resonant sound (as heard at the remote end).

Reverberation is not an artifact of the echo canceller. It is mainly affected by the distance of the microphone from the speech source and by the resonances of the room. While reverberation can be unpleasant, it is not compensated for by the AEC, which only removes reflections of remote speech. If the remote end complains that they hear echo, ensure that they are referring to hearing their own voice and not echoes of local talkers.

You cannot remove the effects of reverberation by changing the EF1210's settings, but you can minimize reverberation by moving microphones closer to talkers and, if necessary, adding acoustical treatment to the room.

Finding the Source of Echo

Try muting one channel at a time to see if the echo goes away when a particular channel is muted. You can mute the channel by using the `MUTEI` command on the EF1210 or by muting it on the automixer (turn down volume of the microphone on mixer or use the logic port control). If you find that the echo goes away when a particular channel is muted, the microphone may not be calibrated correctly. Check one or more of the following issues.

Acoustic Gain

The most common cause of poor echo cancellation performance is incorrectly adjusted acoustic gain. This may be explained as follows. The reference signal seen by the AEC is sent to the Zone output, where it is amplified and sent to the room loudspeakers. The loudspeaker audio is coupled into the room microphones acoustically, through direct and reflected acoustic paths, and perhaps also through mechanical coupling. The microphone signal is then amplified and sent to the AEC as the local microphone input signal. The acoustic gain of a microphone channel refers to the relative levels of the signal sent to the Zone output (before any amplification) and the level of this signal that is reflected as the microphone input (after microphone amplification).

If the electrical level of the reflected signal picked up by microphone is the same as the level of the electrical signal sent from the AEC to the Zone output, the acoustic gain of this microphone channel is said to be 0 dB. If the reflected signal picked up by the microphone is higher than the level of the signal sent to the Zone output, that microphone channel has positive acoustic gain. The more positive the acoustic gain, the harder the AEC must work to determine which signal is an echo and which is a local speech signal.

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Acoustic Gain Failure

Acoustic gain failure can be caused through a number of mechanisms:

1. The most common is excessive amplification of the remote (reference) signal at the local Zone output. This may be explained as follows. If the reference signal is too low coming into the EF1210, the room audio amplifier will need to be turned up to compensate and bring the room audio to an acceptable level. For example, if the reference signal is 12 dB too low (just barely lighting the first green LED on the REMOTE SIGNAL LEVEL METER), the room audio will need to be amplified by approximately 12 dB to bring it to a reasonable listening level. This adds 12 dB to the acoustic gain, which will most likely cause it to exceed the amplifier acoustic gain limit (See "Check Acoustic Gain" on page 31.). This situation can be remedied by proper calibration of the Reference input signal.
2. Another common cause of acoustic gain failure is excessive microphone amplification. For example, if a microphone is "hot" by 6 dB, then the reflections of the Zone output signal which are picked up by the microphone will be amplified by 6 dB more than necessary. This adds 6 dB to the acoustic gain, which may be sufficient to cause acoustic gain problems. This situation could easily arise if, for example, the conferencing equipment is set up so that participants are too far from the microphone. In such a situation, after correct microphone setup the local microphone audio level may be too low because of the distance from the talker to the microphone. The microphone audio will most likely also be muddy and reverberant. The installer or user may try to solve these microphone audio quality problems by turning up the microphone amplification, thus adding to the acoustic gain. This problem can be remedied by proper microphone selection (pickup pattern, directionality) and placement, coupled with proper microphone calibration.
3. A third common cause of acoustic gain problems is excessive coupling between loudspeaker audio and microphones. This can be addressed by reducing the microphone coupling, either by positioning microphones so that their pickup patterns are biased away from the loudspeaker audio (and direct reflections of loudspeaker audio), repositioning loudspeakers, or reducing the loudspeaker amplification.

In summary, it can be seen from the above that any amplification applied between the reference input and the microphone inputs can add to acoustic gain problems. To avoid problems, ensure that the Reference input signal (as reflected on the REMOTE SIGNAL LEVEL METER) is not too low, and the microphone input signal (as reflected on the INPUT SIGNAL LEVEL METER) is not too high. Run the built-in EF1210 Acoustic Gain test to verify that you do not have acoustic gain problems (See "Check Acoustic Gain" on page 31.).

In-Conference Quick Check

If you experience residual echo problems during a conference, you can quickly check that the reference and microphone levels are calibrated and not causing acoustic gain problems by observing the signal level meters as follows.

While the remote end is speaking and everyone on the local end is quiet, observe the activity on the REMOTE SIGNAL LEVEL METER. Remote speech should illuminate the first yellow (0 dB) LED regularly, and the second (+3 dB) LED occasionally. Step through the microphone input channels by repeatedly pressing the INPUT SELECT front panel button while the remote end is speaking (the local end must be silent during this check), and observe the activity on the INPUT SIGNAL LEVEL METER for each microphone channel in response to the remote talker. If any microphone channel exhibits greater signal level activity than that shown on the REMOTE SIGNAL LEVEL

METER, this indicates a possible problem with the acoustic gain on that microphone channel.

If this excessive coupling activity level is evident on only one microphone input channel, that microphone channel should either be redirected to reduce coupling to loudspeaker audio, or recalibrated as it will need to be turned down. If the excessive coupling activity is observed on all (or most) microphone channels, then this indicates either that the room audio is too loud or the reference signal may need to be recalibrated (this will be indicated by observing low activity levels on the REMOTE SIGNAL LEVEL METER).

> ***Note.*** *Before you readjust the Remote input levels, check to make sure you are looking at the correct remote input level (AEC A or AEC B) on the REMOTE LEVEL INDICATOR. Check to make sure that the microphone that you are looking at is in the zone that you think it is in and that you are looking at the correct channel on the INPUT LEVEL INDICATOR.*

Excessive Microphone Amplification

For the EF1210 to adapt effectively, saturation (overload or clipping) must not occur at the A-D converter supplying the microphone input. Saturation introduces nonlinear signal distortions into what the AEC expects is a linearly echoed version of the remote speech.

Nonlinear distortion causes a degradation or divergence of the AEC's internal model of the room acoustics. In this situation, the EF1210 cannot effectively cancel room echoes and a substantial amount of echo may be heard by the remote party.

Excessive microphone amplification also increases acoustic gain (See "Acoustic Gain Failure" on page 45.). You can check for excessive microphone amplification by observing the front panel INPUT LEVEL INDICATOR during a normal conference. The first yellow LED should illuminate frequently. If the second yellow LED is illuminated constantly during normal speech or if the red LED illuminates or even flickers, reduce the microphone input level.

> ***Note.*** *Before you readjust the microphone input levels, check to make sure you are looking at the correct channel on the INPUT LEVEL INDICATOR. Check also to make sure that you are looking at the correct corresponding reference input level on the REMOTE LEVEL INDICATOR.*
>
> ***Note.*** *If you adjust the MIC/LINE INPUT level, you will affect the acoustic gain. Check to make sure that the acoustic gain limit is not exceeded. See "Check Acoustic Gain" on page 31.*

Insufficient Microphone Amplification

Grossly insufficient microphone gain degrades EF1210 performance and weakens the out-bound speech power level. This has the effect of reducing the signal-to-noise ratio of the microphone signal, which is analogous to raising the background noise level in the room. Because this noise is uncorrelated with the echoes within the room, the EF1210's ability to adapt and cancel echoes is compromised.

A second effect of insufficient microphone gain is that the power of the microphone input signal may be substantially lower than that of the remote input signal. This

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reduces the ability of the decision logic to determine whether the AEC should be in transmit, receive, or double-talk mode. This effect may reduce the effectiveness of the EF1210 in canceling echoes.

You can check for insufficient microphone amplification by observing the front panel INPUT LEVEL INDICATOR during normal conferencing conversation. The first yellow LED should illuminate frequently. If the INPUT LEVEL INDICATOR never illuminates beyond one or two green LEDs during normal speech, increase the microphone's input level.

> ***Note.*** *Before you readjust the microphone input levels, check to make sure you are looking at the correct channel on the INPUT LEVEL INDICATOR. Check also to make sure that you are looking at the correct corresponding reference input level on the REMOTE LEVEL INDICATOR.*
>
> ***Note.*** *If you adjust the MIC/LINE INPUT level, you will affect the acoustic gain. Check to make sure that the acoustic gain limit is not exceeded. See "Check Acoustic Gain" on page 31.*

Loudspeaker Nonlinearity

Overdriving the loudspeaker may distort the zone output signal and cause ineffective AEC operation. The EF1210 relies on the linearity of the acoustic feedback path — D-A, amplifier, loudspeaker, microphone, and A-D — to cancel acoustic echoes. If you overdrive the loudspeaker, the acoustic reflections picked up by the microphone do not match the signal fed to the loudspeaker. They are distorted copies of this signal. The EF1210 cannot effectively cancel this distorted signal.

If you suspect the loudspeaker is introducing nonlinearities into the room acoustic path, take these steps to minimize its influence on the echo canceller.

- Keep the loudspeaker's volume level at less than three-eighths of full scale. If higher volume is required, the EF1210 should operate effectively at volume settings of up to 50 percent of full scale. At more than 50 percent, most audio systems and loudspeakers introduce significant nonlinearities. The EF1210 may not adapt under these conditions, and echoes may be heard.
- If the loudspeaker has a bass control, lower it. Excessive bass can cause a *boomy* effect that is nonlinear. In addition, excessive bass may cause substantial mechanical coupling to the microphone through vibrations induced in the housings and support structures.
- Increase the separation distance between microphones and the loudspeaker. The EF1210 handles up to 10 dB of acoustic gain between the loudspeaker and the microphone. You may be exceeding this limit if the loudspeaker is pointed directly at the microphones or if the loudspeaker volume is excessive (loudspeaker placement is not critical, but it should not be pointed directly at the microphones).

REMOTE CONTROL PROBLEMS

If the remote control device doesn't seem to be affecting the EF1210, there are a few things you can check. Try sending commands that have a visible impact, like the `MUTEI` command (muting all channels will cause the MUTE ALL LED to light). Also, look for messages from the EF1210, like acknowledgment or error messages, if the remote control device can display them.

Check Command Syntax

Make sure the commands that are being sent to the EF1210 have the correct syntax. If only a couple of the commands aren't being processed, there may be an error in the syntax of those commands. Remember, the commands are case sensitive. Commands should be typed with all capital letters. The EF1210 should return ERROR# messages if the commands are typed incorrectly, as long as error messages are enabled.

Check Device ID

Make sure the Device ID of the EF1210 matches the Device ID of the commands that are being sent. If they don't match, the EF1210 will ignore all the commands. Try sending a command to all devices (*** instead of Device Type and Device ID). If this works but sending commands to a specific device doesn't, the Device ID doesn't match.

Check RS-232

Make sure the RS-232 cable is connected securely to the EF1210 and the remote control device. Also, the RS-232 port on the remote control device should be set to 9600, 8-N-1.

CONTACTING TECHNICAL SUPPORT

If these troubleshooting guidelines don't resolve the problem you are experiencing with the EF1210, please check our web site (*http://www.aspi.com*) for the most current technical support information (go to Technical Resources, then to Technical Support). If you have further questions, please contact us at:

Applications Engineering
ASPI Digital
1720 Peachtree St. NW Suite 220
Atlanta, GA 30309-2439

Phone: (404) 892-3200
Fax: (404) 892-2512
Email: *help@aspi.com*

Before contacting us, please review the warranty and repair policy on page 51.

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TECHNICAL SPECIFICATIONS

MECHANICAL SPECIFICATIONS

Dimensions	19” (483 mm) W x 8.2” (208 mm) L x 1.75” (45 mm) H (full rack unit)
Weight	5.5 lb.
Connectors	Audio: Mini (3.5mm) quick connect terminal blocks RS-232: DB9F ASPI Bus In/Out: RJ45

ELECTRICAL SPECIFICATIONS

Power	100 - 240 VAC; 50-60 Hz
Power Consumption	40 W
Phantom Power	28 V
Microphone Input	-30 dBu to +0 dBu/-66 dBu to -33 dBu, nominal Range is rear panel switch selectable
AEC Reference Input	-20 dBu to +0 dBu, nominal, software adjustable
Line Output	+0 dBu, nominal
Zone Output	-10 dBV (-8 dBu) or 0 dBu, nominal, selectable +6 to -12 dB via front panel setup. -20 dBu to +0 dBu, nominal, software selectable via RS-232 setup.
Automixer Input	0 dBu, nominal
CODEC Output	-10 dBV (-8 dBu) or 0 dBu, nominal, selectable via front panel setup. -20 dBu to +0 dBu, nominal, software selectable via RS-232 setup.
Playback Input	-10 dBV (-8 dBu), nominal, software selectable -8 to +8 dB gain
Record Output	-10 dBV (-8 dBu), nominal
Input Impedance	> 10 kOhms
Output Impedance	50 Ohms (drives 600 Ohms)
Headroom	20 dB, nominal

PERFORMANCE SPECIFICATIONS

Frequency Response	with AEC on: 125 Hz - 7.25 kHz +/- 2 dB in NC only mode (AEC off): 20 Hz - 22 kHz
Echo Cancellation Span	200 ms
Total Cancellation	> 65 dB
Convergence Rate	30 dB/second
Noise Cancellation	6 dB or 10 dB, selectable

COMPLIANCE

The EF1210 complies with the ITU G.167 Recommendation for AEC, FCC part 15,

and CE requirements.

FCC Part 15

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning! ***FCC Regulations state that any unauthorized changes or modifications to this equipment not expressly approved by the manufacturer could void the user's authorization to operate this equipment.***

CE

The EF1210 also complies with the CE standards EN50081-1, EN50082-1, and EN60950. Conformity of the equipment with those guidelines is attested by the CE mark.

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WARRANTY INFORMATION

What is covered

Any defect in materials or workmanship.

For how long

Two years.

What we will do

If your ASPI Digital product is defective and returned within two years of the date of purchase, we will repair or, at our option, replace it at no charge to you.

If we repair your ASPI Digital product, we may use new or reconditioned replacement parts. If we choose to replace your ASPI Digital product, we may replace it with a new or reconditioned one of the same or similar design. The repair or replacement is warranted for either (a) 90 days or (b) the remainder of the original two-year warranty period, whichever is longer.

Limitations

ASPI Digital shall not be responsible for special, incidental, indirect, or consequential damages resulting from any breach of warranty, or under any other legal theory, including but not limited to loss of profits, downtime, goodwill, damage to or replacement of equipment and property, and any cost of recovering, reprogramming, or reproducing any program or data stored in or used with ASPI Digital products.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion of incidental or consequential damages, so the above exclusions or limitations may not apply to you.

What we ask you to do

To obtain warranty service for your ASPI Digital product, call us at (404) 892-3200 or fax us at (404) 892-2512 and we will issue a Return Material Authorization number (RMA#). Use the original packaging materials to return the product. Ship the product prepaid to:

ASPI Digital
Attention: Warranty Repair
RMA# (*Must be on package*)
1720 Peachtree Street NW, Suite 220
Atlanta, Georgia 30309-2439 USA

Please be sure to include your name, company, address, phone number, and a description of the problem. After repairing or replacing your ASPI Digital product, we will ship it to you via a surface carrier of our choice at no cost to you. If you wish it shipped via a specific carrier at your cost, you must arrange it when you obtain the RMA#.

Repair or replacement of your ASPI Digital product is your exclusive remedy.

What this warranty does not cover

This warranty does not cover defects resulting from accidents, damage while in transit to our service location, alterations, unauthorized repair, failure to follow instructions, misuse, fire, flood, lightning, acts of God, or use in those countries where such use violates Part 779 of the Export Administration Regulations of the United States Department of Commerce.

If your ASPI Digital product is not covered by our warranty, call us at (404) 892-3200 or fax us at (404) 892-2512 for advice about whether we will repair your ASPI Digital product and for other repair information, including charges. ASPI Digital, in its sole discretion, may replace rather than repair your ASPI Digital product with a new or reconditioned one of the same or similar design. The repair or replacement is warranted for 90 days.

The limited warranties and remedies set forth above are exclusive and in lieu of all other warranties, whether oral or written, express or implied. ASPI Digital specifically disclaims any and all implied warranties, including, without limitation, the warranties of merchantability and fitness for a particular purpose.

No User Serviceable Parts

This product contains no user serviceable parts. Please contact ASPI Digital for repairs. Attempts to repair this product by an unauthorized technician will void your warranty.

State Law Rights

This limited warranty gives you specific legal rights, and you amy have other rights that may vary from state to state.

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EF1210 COMMAND SET REFERENCE

The EF1210 Command Set is used to control an EF1210 using an RS-232 remote control device, such as a touch panel or personal computer. The commands control enabling and configuring the EF1210's features.

The EF1210 Command Set also includes messages, which are sent back to the remote control device. These messages can contain acknowledgment or status messages in response to EF1210 commands.

This reference describes the syntax of all of the available commands and messages, as well as the purpose and effects of each of these commands. In short, it provides all the information necessary to integrate the EF1210 Command Set into a remote control device.

COMMAND SYNTAX

The EF1210 commands are short strings of text, which are case sensitive. The commands contain a Device Type and Device ID for specifying an individual device in a chain of ASPI Digital products on an ASPI Bus, so that commands can be targeted at a specific unit. They also contain a command name, input channel number (in some cases), and some data to be used by the command. Each command is terminated with a carriage return (^M) character.

Description	Number of Characters	Range of Values
Device Type	1	0-9,A-Z,*
Device ID	2	00-31,**
Command Name	1-7	0-9,A-Z
Channel Number	1, if applicable	1-8, A-B, 0-3, *
Command Data	0-32	ASCII characters
Terminator	1	^M

Device type

The Device Type indicates which ASPI Digital product the command is being sent to. For the EF1210, the device type is always 'C'.

Device ID

The Device ID is a two digit decimal number indicating the Device ID number of a specific device. This is the same Device ID that is set by the rear panel DIP switches on the EF1210. The Device ID must always have two digits, so if the ID is less than ten, a leading zero is needed. For example, the Device ID for unit six is '06'.

Each EF1210 in a system should have a different Device ID, so they can each be addressed individually. It's ok for an EF1210 to have the same Device ID as a different ASPI Digital product such as an EF200 Phone Add, because they will be differentiated by the device type.

On the EF1210, the Device ID can be a 2 digit number from 00 to 31

Command name

The command name is a unique string of characters that indicates which command the EF1210 should execute. Command names for different products are not necessarily the same, since the function and features of each product are different. A list of available EF1210 command names is shown in Table 5 on page 55.

Channel number

The channel number indicates which input channel, reference input, zone output or memory slot the command is being applied to. It is not included in all commands. Only commands that need to be applied individually, such as the AEC command, include the channel number. Microphone input channels are denoted in this Command Set Reference by the character '*n*'. Reference inputs and Zone outputs are denoted by the character '*c*'. Memory slot locations are denoted by the character '*m*'.

Command data

The command data is a string of up to 32 ASCII characters which follows the command name. The allowed content of the command data depends on which command is being used. Usually, this is only one character because most commands just turn a feature on or off. Some commands, however, may have several characters worth of data.

Sending commands to multiple devices

Commands can be sent to multiple devices by replacing the device type or Device ID characters with the '*' character.

Example

The following example commands illustrate the different ways you can send commands to multiple devices by replacing the device type and/or Device ID with '*' characters.

Command	Effects
C12ACKMOD1	Enable acknowledgment mode on the EF1210 with Device ID 12.
*03ERROR1	Enable error messages for devices of all types with Device ID 3.
C12AEC*0	Disable AEC on all channels on the EF1210 with Device ID 12.
***SWVER?	Request software version of all devices of all types.

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VALID COMMANDS AND MESSAGES

The following table is a list of commands recognized by the EF1210.

Table 5: EF1210 Command List

Command	Meaning	Page
ACKMOD	enable/disable acknowledgment mode	56
AEC*n*	enable/disable acoustic echo canceller on channel *n*	58
AECS*n*	set suppression mode on channel *n*.	59
ERROR	enable/disable error messages	61
GAINC	set CODEC output gain	62
GAINI*n*	set MIC/LINE input gain on channel *n*	63
GAINP	set playback input gain (on AUX IN input)	65
GAINR*c*	set REFERENCE input gain on reference *c*	66
GAINZ*c*	set ZONE output gain on output *c*	68
LOCKFP	lock front panel (disables front panel buttons)	69
MUTEI*n*	enable/disable mute on MIC input channel *n*	70
NC*n*	enable/disable noise cancellation on channel *n*	71
NCL*n*	set noise cancellation level on channel *n*	72
PING	see what devices are connected to the remote controller	73
REFASGN*nc*	assign reference *c* to input channel *n*	
RESETF	restore settings to factory default	75
RESTNV*m*	restore settings from non-volatile memory in memory slot *m*	76
SAVENV*m*	save current settings to non-volatile memory in memory slot *m*	77
SELECTI*n*	set front panel input meter to display input channel *n*	78
SELECTR*c*	set front panel remote meter to display remote input channel *c*	79
SR	change the sample rate of the EF1210	80
SWVER	request software version	81

The following table is a list of messages sent by the EF1210 to the host.

Table 6: EF1210 Message List

Message	Meaning	Page
ERROR#	error condition occurred	82
PONG	device response to PING command	83

ACKMOD - ENABLE/DISABLE ACKNOWLEDGMENT MODE

If acknowledgment mode is enabled, the EF1210 will acknowledge each command it receives by repeating the status of the command that was sent. This may be used for verifying that each command is received and recognized by the EF1210. When acknowledgment mode is turned off, the remote control device can always request the status of a parameter by sending a query command, such as `NC?`. When acknowledgment mode is enabled, a query command only generates one message in response. For example, when you send `NC?`, you don't get `NC?` back in addition to the status of the noise cancellation feature.

Since acknowledgment mode reports the status of the command rather than simply echoing back the command, you get a verification that the command had the effect you thought it would. For example, a command that toggles a parameter will give you the new on or off status, rather than just echoing the toggle command.

The factory default setting for `ACKMOD` is `1` (on).

Remote Commands

The following commands can be sent by the remote control device to enable or disable acknowledgment mode.

Remote Command	Effects
`ACKMOD0`	Turn off acknowledgment mode.
`ACKMOD1`	Turn on acknowledgment mode.
`ACKMOD2`	Toggle acknowledgment mode on or off.
`ACKMOD?`	Request status of acknowledgment mode.

EF1210 Messages

The following messages are sent by the EF1210 in response to an `ACKMOD?` command, or in response to any `ACKMOD` command when acknowledgment mode is on.

EF1210 Message	Message meaning
`ACKMOD0`	Acknowledgment mode is currently off.
`ACKMOD1`	Acknowledgment mode is currently on.

Example

At the beginning of the example, acknowledgment mode is turned off at first. The remote control device turns on noise cancellation, but does not receive an acknowledgment. The remote control device requests the status of acknowledgment mode,

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turns it on, and then turns off noise cancellation. This time, it gets an acknowledgment.

Remote Command	EF1210 Message
C23NC1	
C23ACKMOD?	C23ACKMOD0
C23ACKMOD1	C23ACKMOD1
C23NC0	C23NC0
C23NC2	C23NC1

AEC*N* - ENABLE/DISABLE ACOUSTIC ECHO CANCELLER ON CHANNEL *N*

The acoustic echo canceller is the heart of the EF1210, which eliminates echoes and acoustic feedback that occur when loudspeaker audio is picked up by room microphones. The only instance when you may want to use this command is when you put the EF1210 into wideband noise cancellation mode, which can only be enabled if the AEC is disabled on each channel.

The factory default setting for AEC*n* is 1 (on).

Remote Commands

The following commands can be sent by the remote control device to enable or disable acoustic echo cancellation.

Remote Command	Effects
AEC*n*0	Turn off AEC on channel *n.* *n* ranges from 1 to 8.
AEC*n*1	Turn on AEC on channel *n*.
AEC*n*2	Toggle AEC on or off for channel *n.*
AEC*n*?	Request AEC status for channel *n*.

EF1210 Messages

The following messages are sent by the EF1210 in response to an AEC*n*? command, or in response to any AEC command when acknowledgment mode is on.

EF1210 Message	Message meaning
AEC*n*0	AEC is currently off on channel *n*.
AEC*n*1	AEC is currently on on channel *n*.

Example

In the following example, the remote control device disables the AEC on all channels on the EF1210 with Device ID number 7. Then it enables the AEC on channel 2 and requests the AEC status on channel 6 of the same EF1210. Acknowledgment mode is enabled.

> ***Note.*** *It is possible to use a wildcard (*) for setting AECn to 0 or 1 (turning on/off), but not for querying or toggling.*

Remote Command	EF1210 Message
C07AEC*0	C07AEC*0
C07AEC21	C07AEC21
C07AEC6?	C07AEC60

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AECS*N* - SET SUPPRESSION MODE ON CHANNEL *N* TO NORMAL OR AGGRESSIVE.

Suppression Level Selection

The EF1210 has been designed and carefully optimized to provide the best possible balance between removing as much vestigial echo as possible and maintaining natural, full-duplex performance when both parties speak at the same time or one party tries to interrupt the other. As designed, the EF1210 should have no difficulty completely removing audible echo and adapting almost instantaneously to movements and level changes within the room as long as the EF1210 is set up correctly. However, it is possible that some room environments may be so harsh as to strain the boundaries of the operation of the EF1210. This may occur if the room is exceedingly reverberant, the room acoustic gain limit is exceeded, or there is an excessive amount of background room noise which results in a low signal-to-noise ratio on both local speech and echo signals.

In conditions of excessive background noise, the signal-to-noise ratio of the local speech signal can drop so low as make the conferencing system virtually unusable. In such conditions, it is difficult for the AEC to cancel echoes much below the noise floor. While the EF1210's superior noise cancellation subsystem can reduce the objectionable audible impact of high room noise to make the conferencing experience more enjoyable and less fatiguing, in certain very harsh conditions this may mean that the residual echo is now more audible because the noise floor has been so dramatically reduced.

Another difficult situation for the EF1210 arises when the room acoustic gain limit is approached or exceeded. As the acoustic gain limit is approached, it becomes more difficult for the EF1210 to adapt to level changes or movement in the room (including normal conferencing participant movement, movement of papers, etc.) as a result of which snippets of echo may be heard for longer periods than would be desirable.

Should it be necessary to operate the EF1210 in such hostile conditions, the echo suppression performance of the EF1210 may be enhanced to remove any vestigial traces of echo, at the expense of doubletalk performance. In aggressive suppression mode, users on the remote end will hear dropouts and clipping artifacts when they attempt to talk across a local participant. The AECSn command may be used to select either normal suppression mode (default) or aggressive suppression mode if required by harsh room conditions.

The factory default setting for AECS*n* is 0 (normal).

Remote Commands

The following commands can be sent by the remote control device to set the suppression mode level.

Remote Command	Effects
AECS*n*x	Set suppression mode on channel *n* to x. x is the noise suppression mode (0 = normal; 1 = aggressive).
AECS*n*?	Request AECS status for channel *n*.

EF1210 Messages

The following messages are sent by the EF1210 in response to an AECS*n*? command, or in response to any AECS command when acknowledgment mode is on.

EF1210 Message	Message meaning
AECS*n*0	Suppression mode is currently normal on channel *n*.
AECS*n*1	Suppression mode is currently aggressive on channel *n*.

Example

In the following example, the remote control device sets the suppression mode to normal on all channels on the EF1210 with Device ID number 7. Then it sets the suppression mode on channel 2 to aggressive and requests the suppression mode status on channel 6 of the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07AECS*0	C07AECS*0
C07AECS21	C07AECS21
C07AECS6?	C07AECS60

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ERROR - ENABLE/DISABLE ERROR REPORTING

When the EF1210 detects an error (usually a command syntax error), it may report it using the ERROR# message. The ERROR command enables or disables the error reporting feature. This is useful for debugging the commands coming from the remote control device.

The factory default setting for ERROR is 1 (on).

Remote Commands

The following commands can be sent by the remote control device to enable or disable error reporting.

Remote Command	Effects
ERROR0	Turn off error reporting.
ERROR1	Turn on error reporting.
ERROR2	Toggle error reporting on or off.
ERROR?	Request status of error reporting.

EF1210 Messages

The following messages are sent by the EF1210 in response to an ERROR? command, or in response to any ERROR command when acknowledgment mode is on.

EF1210 Message	Message meaning
ERROR0	Error reporting is currently off.
ERROR1	Error reporting is currently on.

Example

In the following example, the remote control device requests the error reporting status of the EF1210 with Device ID number 7. Then it enables the error reporting of the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07ERROR?	C07ERROR0
C07ERROR1	C07ERROR1

GAINC - SET CODEC OUTPUT GAIN

The GAINC command sets the CODEC output gain level of the EF1210 to a level between 0 dB and 20 dB. The output gain setting corresponds to a nominal output level that ranges from -20 dBu to 0 dBu, respectively.

The factory default setting for GAINC is 12 (-8 dBu = -10 dBV).

Remote Commands

The following commands can be sent by the remote control device to set the CODEC output gain level.

Remote Command	Effects
GAINCx	Set CODEC output gain. x ranges from 0 dB to 20 dB.
GAINC?	Request current CODEC output gain.

EF1210 Messages

The following messages are sent by the EF1210 in response to a GAINC? command, or in response to any GAINC command when acknowledgment mode is on.

EF1210 Message	Message meaning
GAINCx	CODEC output gain is currently x dB.

Example

In the following example, the remote control device requests the current CODEC output gain of the EF1210 with Device ID number 7. Then it sets a new level on the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07GAINC?	C07GAINC0
C07GAINC4	C07GAINC4

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GAINI*N* - SET MIC/LINE INPUT GAIN ON CHANNEL *N*

The `GAINIn` command sets the MIC/LINE input gain level on channel *n* of the EF1210 to a level between 0 dB and 31 dB. This corresponds to a nominal input signal level between 0 dBu to -31 dBu, respectively for line level. For mic level, this corresponds to a nominal input signal level between -33 dBu to -64 dBu, respectively. Setting `GAINIn` to 0 corresponds to a nominal input signal level of 0 dBu line level, or -33 dBu mic level. Setting `GAINIn` to 31 corresponds to a lower nominal input signal level of -31 dBu line level or -64 mic level.

The purpose of the input channel gain is to bring the signal level of the input channel to a constant value at the A/D inside the EF1210. For example, if we expect a -10 dBu line level signal or -43 dBu mic level signal at the input of channel 2, we would set the input gain of channel 2 to 10 dB by sending the command `GAINI210`. If we expect a lower signal level, say -18 dBu line level or -51 dBu mic level, on channel 3 then we would turn up the gain by 18 dB on channel 3. This would be accomplished by sending the command `GAINI318`.

The input channel gain is set using EF1210 calibration procedures (See "Calibration Step 1: Calibrating Microphone Input Channels" on page 29.).

The factory default setting for `GAINIn` is 0 (0 dBu nominal level expected at input).

Remote Commands

The following commands can be sent by the remote control device to set the MIC/LINE input gain level.

Remote Command	Effects
`GAINInx`	Set MIC/LINE input gain on channel *n*. *n* ranges from 1 to 8. x ranges from 0 dB to 31 dB.
`GAINIn?`	Request current MIC/LINE input gain on channel *n*.

> ***Note.*** *The wildcard character (*) is not allowed for specifying the channel number n for the GAINIn command.*

EF1210 Messages

The following messages are sent by the EF1210 in response to a `GAINIn?` command, or in response to any `GAINIn` command when acknowledgment mode is on.

EF1210 Message	Message meaning
`GAINInx`	MIC/LINE input gain on channel *n* is currently x dB.

Example

In the following example, the remote control device requests the current MIC/LINE input gain on channel 5 of the EF1210 with Device ID number 7. Then it sets a new level on channel 5 on the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07GAINI512	C07GAINI512
C07GAINI2?	C07GAINI20

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GAINP - SET PLAYBACK INPUT GAIN (ON AUX IN INPUT)

The GAINP command sets the playback input gain level on the AUX IN input of the EF1210 to a level between 0 dB and 15 dB. This corresponds to a nominal playback signal level between 0 dBu and -15 dBu, respectively. For instance, setting GAINP to 0 corresponds to a nominal playback signal level of 0 dBu, and setting GAINP to 15 corresponds to a lower nominal playback signal level of -15 dBu.

The purpose of the playback input gain is to bring the signal level of the playback input to a constant value at the A/D inside the EF1210. For example, if we expect a -12 dBu signal at the playback input, we would set the playback input gain to 12 dB by sending the command GAINP12.

The playback input gain is set using EF1210 calibration procedures (See "Using the EF1210 Without RS-232 Control" on page 38.).

The factory default setting for GAINP is 8 (-8 dBu = -10 dBV nominal level expected at input).

Remote Commands

The following commands can be sent by the remote control device to set the playback input gain level.

Remote Command	Effects
GAINPx	Set playback input gain. x ranges from 0 dB to 15 dB.
GAINP?	Request current playback input gain.

EF1210 Messages

The following messages are sent by the EF1210 in response to a GAINP? command, or in response to any GAINP command when acknowledgment mode is on.

EF1210 Message	Message meaning
GAINPx	Playback input gain is currently x dB.

Example

In the following example, the remote control device requests the current playback input gain of the EF1210 with Device ID number 7. Then it sets a new level on the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07GAINP?	C07GAINP0
C07GAINP4	C07GAINP4

GAINR*C* - SET REFERENCE INPUT GAIN ON REFERENCE *C*

The GAINR*c* command sets the Reference input gain level on reference *c* of the EF1210 to a level between 0 dB and 20 dB. This corresponds to a nominal Reference input signal level between 0 dBu and -20 dBu, respectively. For instance, setting GAINR*c* to 0 corresponds to a nominal Reference input signal level of 0 dBu, and setting GAINR*c* to 20 corresponds to a lower nominal Reference input signal level of -20 dBu.

The purpose of the Reference input gain is to bring the signal level of the Reference input to a constant value at the A/D inside the EF1210. For example, if we expect a -12 dBu signal at the Reference input A (AEC A), we would set the Reference input gain of Reference A to 12 dB by sending the command GAINRA12.

The Reference input gain is set using EF1210 calibration procedures (See "Calibration Step 3: Calibrating AEC Reference Inputs" on page 32.).

The factory default setting for GAINR*c* is 20 (-20 dBu nominal level expected at input).

Remote Commands

The following commands can be sent by the remote control device to set the REFERENCE input gain level.

Remote Command	Effects
GAINR*c*x	Set REFERENCE input gain on reference c. *c* is either A or B. x ranges from 0 dB to 20 dB.
GAINR*c*?	Request current REFERENCE input gain on reference *c*.

Note. *The wildcard character (*) is not allowed for specifying the channel number c for the GAINRc command.*

EF1210 Messages

The following messages are sent by the EF1210 in response to a GAINR*c*? command, or in response to any GAINR*c* command when acknowledgment mode is on.

EF1210 Message	Message meaning
GAINR*c*x	REFERENCE input gain on reference *c* is currently x dB.

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Example

In the following example, the remote control device requests the current REFERENCE input gain on reference B of the EF1210 with Device ID number 7. Then it sets a new level on reference B on the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07GAINRB?	C07GAINRB0
C07GAINRB4	C07GAINRB4

GAINZ*C* - SET ZONE OUTPUT GAIN ON OUTPUT *C*

The GAINZ*c* command sets the ZONE output gain level on output *c* of the EF1210 to a level between 0 dB and 20 dB. The output gain setting corresponds to a nominal output level that ranges from -20 dBu to 0 dBu, respectively. For instance, setting GAINZ*c* to 0 makes the nominal output level -20 dBu, and setting GAINZ*c* to 20 makes the nominal output level 0 dBu.

The factory default setting for GAINZ*c* is 12 (-8 dBu = -10 dBV).

Remote Commands

The following commands can be sent by the remote control device to set the ZONE output gain level.

Remote Command	Effects
GAINZ*c*x	Set ZONE input gain on output *c*. *c* is either A or B. x ranges from 0 dB to 20 dB.
GAINZ*c*?	Request current ZONE output gain on output *c*.

Note. *The wildcard character (*) is not allowed for specifying the channel number c for the GAINZc command.*

EF1210 Messages

The following messages are sent by the EF1210 in response to a GAINZ*c*? command, or in response to any GAINZ*c* command when acknowledgment mode is on.

EF1210 Message	Message meaning
GAINZ*c*x	ZONE output gain on output *c* is currently x dB.

Example

In the following example, the remote control device requests the current ZONE input gain on output A of the EF1210 with Device ID number 7. Then it sets a new level on output A on the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07GAINZA?	C07GAINZA0
C07GAINZA19	C07GAINZA19

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LOCKFP - LOCK/UNLOCK FRONT PANEL

The LOCKFP command locks the front panel buttons of the EF1210 so that they have no effect.

The factory default setting for LOCKFP is 0 (unlocked).

Remote Commands

The following commands can be sent by the remote control device to lock or unlock the front panel of the EF1210.

Remote Command	Effects
LOCKFP0	Unlock the front panel buttons.
LOCKFP1	Lock the front panel buttons.
LOCKFP2	Toggle between locked and unlocked.
LOCKFP?	Request status of front panel lock.

EF1210 Messages

The following messages are sent by the EF1210 in response to a LOCKFP? command, or in response to any LOCKFP command when acknowledgment mode is on.

EF1210 Message	Message meaning
LOCKFP0	Front panel buttons are currently unlocked.
LOCKFP1	Front panel buttons are currently locked.

Example

In the following example, the remote control device requests the status of the front panel buttons of the EF1210 with Device ID number 12. Then it locks the front panel on the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C12LOCKFP?	C12LOCKFP0
C12LOCKFP1	C12LOCKFP1

MUTEI*N* - ENABLE/DISABLE MUTE ON MICROPHONE INPUT CHANNEL *N*

The `MUTEIn` command mutes the microphone input channel *n* of the EF1210.

The factory default setting for `MUTEIn` is `0` (not muted).

Remote Commands

The following commands can be sent by the remote control device to mute or unmute the microphone input channel *n* of the EF1210.

Remote Command	Effects
`MUTEIn0`	Unmute microphone input channel *n*. *n* ranges from 1 to 8.
`MUTEIn1`	Mute microphone input channel *n*.
`MUTEIn2`	Toggle mute on or off for microphone input channel *n*.
`MUTEIn?`	Request mute status of microphone input channel *n*.

EF1210 Messages

The following messages are sent by the EF1210 in response to a `MUTEIn?` command, or in response to any `MUTEIn` command when acknowledgment mode is on.

EF1210 Message	Message meaning
`MUTEIn0`	Mute is disabled on microphone input channel *n*.
`MUTEIn1`	Mute is enabled on microphone input channel *n*.

Example

In the following example, the remote control device unmutes all channels on the EF1210 with Device ID number 12. Then it mutes the microphone input on channel 4 and requests the mute status on channel 6 of the same EF1210. Acknowledgment mode is enabled.

> ***Note.*** *It is possible to use a wildcard (*) for setting MUTEIn to 0 or 1 (turning on/off), but not for querying or toggling.*

Remote Command	EF1210 Message
`C12MUTEI*0`	`C12MUTEI*0`
`C12MUTEI41`	`C12MUTEI41`
`C12MUTEI5?`	`C12MUTEI50`

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NC*N* - ENABLE/DISABLE NOISE CANCELLATION ON CHANNEL *N*

The noise cancellation feature improves the signal-to-noise ratio of the incoming microphone speech by either 6 or 10 dB. The NC*n* command enables or disables this feature on the channel specified. The NCL*n* command selects between 6 and 10 dB of noise cancellation. Noise cancellation is applied to each microphone channel.

The factory default setting for NC*n* is 1 (on).

Remote Commands

The following commands can be sent by the remote control device to enable or disable noise cancellation on channel *n*.

Remote Command	Effects
NC*n*0	Turn off noise cancellation on channel *n*. *n* ranges from 1 to 8.
NC*n*1	Turn on noise cancellation on channel *n*.
NC*n*2	Toggle noise cancellation on or off on channel *n*.
NC*n*?	Request status of noise cancellation on channel *n*.

EF1210 Messages

The following messages are sent by the EF1210 in response to an NC*n*? command, or in response to any NC*n* command when acknowledgment mode is on.

EF1210 Message	Message meaning
NC*n*0	Noise cancellation is currently off on channel *n*.
NC*n*1	Noise cancellation is currently on on channel *n*.

Example

In the following example, the remote control device turns noise cancellation off on all channels on the EF1210 with Device ID number 12. Then it turns noise cancellation on on channel 1 and requests the noise cancellation status on channel 5 of the same EF1210. Acknowledgment mode is enabled.

> ***Note.*** *It is possible to use a wildcard (*) for setting NCn to 0 or 1 (turning on/off), but not for querying or toggling.*

Remote Command	EF1210 Message
C12NC*0	C12NC*0
C12NC11	C12NC11
C12NC5?	C12NC50

NCL*N* - SET NOISE CANCELLATION LEVEL ON CHANNEL *N*

The noise cancellation feature improves the signal-to-noise ratio of the incoming microphone speech by either 6 or 10 dB. The NC*n* command enables or disables this feature on the channel specified. The NCL*n* command selects between 6 and 10 dB of noise cancellation. Noise cancellation is applied to each microphone channel.

The factory default setting for NCL*n* is 10 (normal).

Remote Commands

The following commands can be sent by the remote control device to change the noise cancellation level.

Remote Command	Effects
NCL*n*x	Set noise cancellation level on channel *n* to x. *n* ranges from 1 to 8. x is either 6 dB or 10 dB.
NCL*n*?	Request current noise cancellation level on channel *n*.

EF1210 Messages

The following messages are sent by the EF1210 in response to an NCL*n*? command, or in response to any NCL*n* command when acknowledgment mode is on.

EF1210 Message	Message meaning
NCL*n*x	The noise cancellation level on channel *n* is x. x is either 6 dB or 10 dB.

Example

In the following example, the remote control device sets the noise cancellation level to 10 dB on all channels on the EF1210 with Device ID number 12. Then it requests the noise cancellation status on channel 5 and sets the noise cancellation level on channel 7 to 6 dB of the same EF1210. Acknowledgment mode is enabled.

> ***Note.*** *It is possible to use a wildcard (*) for setting NCLn to 6 or 10, but not for querying.*

Remote Command	EF1210 Message
C12NCL*10	C12NCL*10
C12NCL5?	C12NCL510
C12NCL76	C12NCL76

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PING - SEE WHICH DEVICES ARE PRESENT

The PING command "pings" all of the devices on the ASPI Bus to find out what is connected to it. Each device will respond with a PONG message, which contains its device type and device ID. This lets you know how many of each type of device are connected, and what device ID they have.

Generally, the PING command should be used with asterisks to query all devices, or devices of a certain type. For example, ***PING queries all devices on the bus, while C**PING queries all EF1210s on the bus.

Remote Commands

The following command can be sent by the remote control device to find out what devices are connected to the ASPI Bus.

Remote Command	Effects
PING	Requests a PONG message from the device.

EF1210 Messages

The EF1210 never sends a PING message, but will send a PONG message in response to one (see PONG).

Example

In the following example, the remote control device requests a PONG message from all EF1210s on the ASPI Bus. Two EF1210s respond.

Remote Command	EF1210 Message
***PING	C07PONG
	A18PONG
	A12PONG
	C12PONG
	C14PONG

REFASGN*NC* - AEC REFERENCE ASSIGNMENT

The REFASGN*nc* command assigns reference *c* to input channel *n* of the EF1210.

The factory default setting for REFASGN*nc* is A (Reference Input A).

Remote Commands

The following commands can be sent by the remote control device to change the reference channel assignment.

Remote Command	Effects
REFASGN*n*C	Assign reference *c* to channel *n*. *c* ranges either A or B. *n* ranges from 1 to 8.
REFASGN*n*?	Request reference assignment of channel *n*.

Note. *The wildcard character (*) is not allowed for specifying the channel number n for the REFASGNnc command.*

EF1210 Messages

The following messages are sent by the EF1210 in response to an REFASGN*n*? command, or in response to any REFASGN*n* command when acknowledgment mode is on.

EF1210 Message	Message meaning
REFASGN*nc*	Reference *c* is assigned to channel *n*. *c* is either A or B. *n* ranges from 1 to 8.

Example

In the following example, the remote control device requests the reference channel assigned to channel 1 and channel 2 on the EF1210 with Device ID number 7. Then it assigns Reference A to channel 2 of the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07REFASGN1?	C12REFASGN1A
C07REFASGN2?	C12REFASGN2B
C07REFASGN2A	C12REFASGN2A

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RESETF - RESTORE ALL SETTINGS TO FACTORY DEFAULT

The RESETF command causes all the EF1210 settings to be restored to the factory default. This command does not save the settings to non-volatile memory, but you can follow the RESETF command with a SAVENV command to do this. The variables that are restored as a result of this command are listed at the end of this section. Refer to “Default Values and Saved Parameter List” on page 84

Remote Commands

The following command can be sent by the remote control device to restore the EF1210 to the factory defaults.

Remote Command	Effects
RESETF	Change all the settings back to their factory defaults.

EF1210 Messages

The EF1210 sends a RESETF message in response to a command, after it sends status messages for each of the settings that were changed by the restore operation, if acknowledgment mode is enabled.

EF1210 Message	Message meaning
RESETF	The EF1210 has finished restoring the factory defaults.

Example

In the following example, the remote control device restores the factory default settings of the EF1210 with Device ID number 12. The EF1210 sends back messages notifying the remote control device that the parameters have been reset to the factory standards.

Remote Command	EF1210 Message
C12RESETF	C12RESETF

RESTNV*M* - RESTORE SETTINGS FROM NON-VOLATILE MEMORY IN MEMORY SLOT *M*

The RESTNV*m* command restores the EF1210's settings to the user (power-up) defaults stored in the non-volatile memory. This is useful for putting the EF1210 in its "normal" configuration after someone has changed the settings for a particular call. See the SAVENV*m* command for information about saving the user defaults in non-volatile memory.

When the RESTNV*m* command is sent to the EF1210 by the host, the restore process begins. When the restore process is complete, the EF1210 sends the RESTNV*m* message back to the host as an acknowledgment. The variables that are saved as a result of this command are listed at the end of this document. Refer to "Default Values and Saved Parameter List" on page 84

It is possible to restore one of four (0 - 3) previously saved configurations from memory. See the SAVENV*m* command for a discussion of this feature.

Remote Commands

The following command can be sent by the remote control device to restore the EF1210 to the user defaults.

Remote Command	Effects
RESTNV*m*	Restore settings from non-volatile memory slot *m*. *m* ranges from 0 to 3.

EF1210 Messages

The EF1210 sends a RESTNV*m* message in response to a command after the restore process is complete, if acknowledgment mode is enabled.

EF1210 Message	Message meaning
RESTNV*m*	Settings have been successfully restored from non-volatile memory slot *m*. *m* ranges from 0 to 3.

Example

In the following example, the remote control device restores the default settings of the EF1210 with Device ID number 12. The EF1210 sends back messages notifying the remote control device that the parameters have been reset to the default settings.

Remote Command	EF1210 Message
C12RESTNV0	C12RESTNV0

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SAVENV*M* - SAVE CURRENT SETTINGS TO NON-VOLATILE MEMORY IN MEMORY SLOT *M*

The SAVENV*m* saves the EF1210's current settings to non-volatile memory. These settings will be used as the default settings each time the EF1210 is powered on. The default settings may also be restored by sending the RESTNV*m* command.

Please note that audio may drop out for a second while the EF1210 writes to non-volatile memory. Normally, the SAVENV*m* command is used during the configuration process, when a conversation is not taking place.

Once the SAVENV*m* command is sent from the host to the EF1210, the save process begins. When the save process is completed, the EF1210 sends the SAVENV*m* command back to the host as an acknowledgment. The variables that are saved as a result of this command are listed at the end of this document. Refer to "Default Values and Saved Parameter List" on page 84.

There are 4 storage locations for saving settings. These can be used to store different user configurations. When the EF1210 boots up, it loads the settings from slot 0. In other words, whatever settings you save to slot 0 will be restored every time you reset the EF1210. This provides a way of setting the power-on defaults. Also, every time you perform a front-panel setup, the results of the setup are saved to slot 0. This is done so that you don't have to set up the EF1210 every time you lose power.

Remote Commands

The following commands can be sent by the remote control device to save the current settings in non-volatile memory.

Remote Command	Effects
SAVENV*m*	Save settings to non-volatile memory slot *m*. *m* ranges from 0 to 3.

EF1210 Messages

The EF1210 sends the following message in response to a SAVENV*m* command, if acknowledgment mode is enabled.

EF1210 Message	Message meaning
SAVENV*m*	The settings were successfully saved to non-volatile memory slot *m*. *m* ranges from 0 to 3.

Example

In the following example, the remote control device saves the settings of the EF1210 with Device ID number 12 in memory slot 0

Remote Command	EF1210 Message
C12SAVENV0	C12SAVENV0

SELECTI*N* - SET FRONT PANEL INPUT METER TO DISPLAY INPUT CHANNEL *N*

The SELECTI*n* command sets the front panel INPUT meter to display input channel *n* of the EF1210.

The factory default setting for SELECTI*n* is 1 (input channel 1).

Remote Commands

The following commands can be sent by the remote control device to set the front panel INPUT meter to display input channel *n*.l

Remote Command	Effects
SELECTI*n*	Set front panel INPUT meter to display input channel *n*. *n* ranges from 1 to 8.
SELECTI?	Request current assignment of front panel INPUT meter.

EF1210 Messages

The following messages are sent by the EF1210 in response to a SELECTI? command, or in response to any SELECTI*n* command when acknowledgment mode is on.

EF1210 Message	Message meaning
SELECTIn	Front panel INPUT meter is currently set to display input channel *n*.

Example

In the following example, the remote control device requests the current channel displayed on the INPUT meter of the EF1210 with Device ID number 7. Then it sets channel 5 to be displayed on the INPUT meter of the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07SELECTI?	C07SELECTI1
C07SELECTI5	C07SELECTI5

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SELECTR*C* - SET FRONT PANEL REMOTE METER TO DISPLAY REMOTE INPUT CHANNEL *C*

The SELECTR*C* command sets the front panel REMOTE meter to display reference input channel *c* of the EF1210.

The factory default setting for SELECTR*c* is A (Reference A).

Remote Commands

The following commands can be sent by the remote control device to set the front panel REMOTE meter to display reference input channel *c*.l

Remote Command	Effects
SELECTR*C*	Set front panel REMOTE meter to display reference input channel *c*. *c* is either A or B.
SELECTR?	Request current assignment of front panel REMOTE meter.

EF1210 Messages

The following messages are sent by the EF1210 in response to a SELECTR? command, or in response to any SELECTR*C* command when acknowledgment mode is on.

EF1210 Message	Message meaning
SELECTR*C*	Front panel REMOTE meter is currently set to display reference input channel *c*.

Example

In the following example, the remote control device requests the current reference channel displayed on the REMOTE meter of the EF1210 with Device ID number 7. Then it sets channel 5 to be displayed on the REMOTE meter of the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07SELECTR?	C07SELECTR1
C07SELECTR5	C07SELECTR5

SR - CHANGE THE SAMPLE RATE

The SR command changes the sample rate of the EF1210.

SR16 (16 kHz) is the normal operating mode of the EF1210. The wideband (SR48, 48 kHz) mode is provided for applications that require high-fidelity noise cancellation. In the wideband mode, acoustic echo cancellation is disabled but the noise cancellation continues to function.

The factory default setting for SR is 16 (normal sampling rate).

Remote Commands

The following commands can be sent by the remote control device to change the sample rate of the EF1210.l

Remote Command	Effects
SR16	Change to normal (16 kHz) sampling rate.
SR48	Change to wideband (48 kHz) sampling rate.
SR?	Request current sampling rate.

EF1210 Messages

The following messages are sent by the EF1210 in response to a SR? command, or in response to any SR command when acknowledgment mode is on.

EF1210 Message	Message meaning
SR16	The EF1210 is currently running at its normal (16 kHz) sampling rate.
SR48	The EF1210 is currently running in wideband (48 kHz) mode.

Example

In the following example, the remote control device requests the current sampling rate of the EF1210 with Device ID number 7. Then it changes the sampling rate to 48 kHz of the same EF1210. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C07SR?	C07SR16
C07SR48	C07SR48

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SWVER - REQUEST SOFTWARE VERSION

The SWVER command requests the software version of the EF1210.

Remote Commands

The following commands can be sent by the remote control device to request the software version of the device.

Remote Command	Effects
SWVER?	Request the software version of the EF1210.

EF1210 Messages

The following message is sent by the EF1210 in response to a SWVER? command, indicating its software version.

EF1210 Message	Message meaning
SWVERxx.yy	The EF1210 software version is xx.yy. xx denotes a major revision. yy denotes a minor revision.

Example

In the following example, the remote control device requests the software version of the EF1210 with Device ID number 12.

Remote Command	EF1210 Message
C12SWVER?	C12SWVER1.00

ERROR# - ERROR MESSAGE

The error messages report errors that the EF1210 encounters. These are usually command syntax errors. The errors are numbered, and the meaning of each error number is described below. Error messages are enabled or disabled with the ERROR command and must be enabled for this message to be sent.

Remote Commands

The ERROR# command should not be sent to the EF1210. It's only used as a message from the EF1210.

EF1210 Messages

The following messages are sent by the EF1210 when it has an error.

EF1210 Message	Message meaning
ERROR#01	Unknown command.
ERROR#02	Invalid command data.

Example

In the following example, the remote control device tries to send a few invalid commands to the EF1210 with Device ID 6. The EF1210 returns an error message in response to each of these commands. Error messages are enabled.

Remote Command	EF1210 Message
C06CHEESE	C06ERROR#01
C06PHONE@#$%	C06ERROR#02

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PONG - DEVICE RESPONSE TO PING COMMAND

The PONG message is sent by the EF1210 in response to a PING command. This can be used by the remote control device to find out what device IDs are used by EF1210s. Also, see the PING command.

Remote Commands

The EF1210 will not recognize the PONG command. You should only send the PING command from a remote control device.

EF1210 Messages

The following message is sent by the EF1210 when the remote control device sends it a PING command.

EF1210 Message	Message meaning
PONG	Response from EF device.

Example

In the following example, the remote control device sends the PING command to find out what EF devices are on the bus. One EF1210 and one EF200 returns a PONG message to announce their presence. Acknowledgment mode is enabled.

Remote Command	EF1210 Message
C**PING	C06PONG
	A17PONG

DEFAULT VALUES AND SAVED PARAMETER LIST

Note. *Parameters that are in* ***bold*** *print indicate those affected by a* RESETF, RESTNV, or SAVENV *command.*

Parameter	Default Value
ACKMOD	1 (on)
AEC*n*	1 (on); *n* ranges from 1 to 8.
AECS*n*	0 (normal); n ranges from 1 to 8.
ERROR	1 (on)
GAINC	12 (-8 dBu = -10 dBV)
GAINI*n*	0 (0 dBu); *n* ranges from 1 to 8.
GAINP	8 (-8 dBu = -10 dBV)
GAINR*c*	20 (-20 dBu); *c* is either A or B.
GAINZ*c*	12 (-8 dBu = -10dBV); *c* is either A or B.
LOCKFP	0 (unlocked)
MUTEI*n*	0 (not muted); *n* ranges from 1 to 8.
NC*n*	1 (on); *n* ranges from 1 to 8.
NCL*n*	10 (normal); *n* ranges from 1 to 8.
REFASGN*n*	A (Reference Input A); *n* ranges from 1 to 8.
SELECTI*n*	1 (Input Channel 1); *n* ranges from 1 to 8.
SELECTR*c*	A (Reference Input A); *c* is either A or B.
SR	16 (normal sampling rate)

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APPLICATIONS

DISTANCE LEARNING

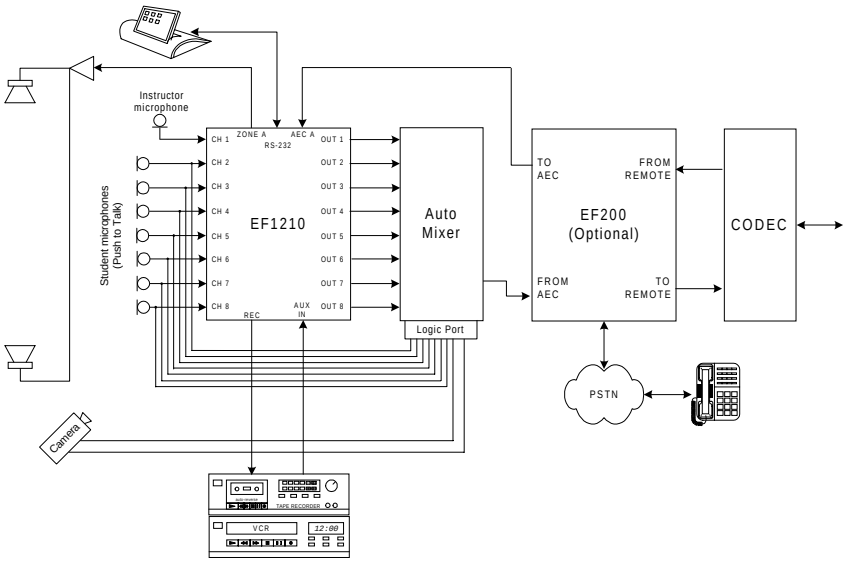

Figure 17. Distance Learning using the EF1210

Distance learning classrooms are usually made up of the components shown in Figure 17, which include the EF1210 and the EF200 Phone Add.

Logic in/out for a video camera to turn to the student talker should be implemented on the logic port of the auto mixer. Microphone muting should likewise be implemented using the logic port of the auto mixer or muted by remote control on the EF1210 line levels outputs. We recommend this so that the microphone is muted at the line outputs of the EF1210 or the input of the automixer, which allows the microphone input to still be processed by the echo canceller in the EF1210. A useful option would be to provide the instructor with an RS-232 remote control device that will allow the instructor to mute student microphones using the EF1210 command set.

COURTROOMS

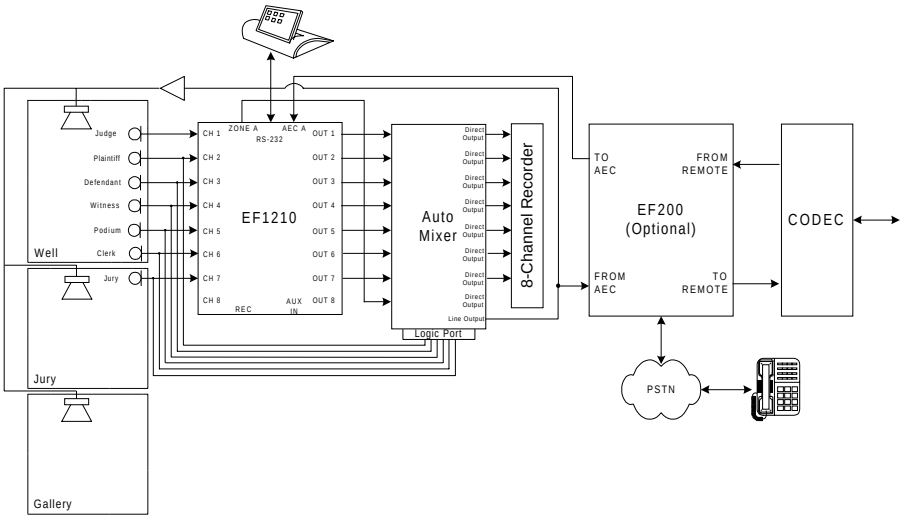

Figure 18. Court Rooms using the EF1210

In courtroom applications, the Zone output should be mixed with all input microphone channels in the auto mixer to be output to an amplifier or powered loudspeakers. A typical courtroom setup may include microphones for the judge, plaintiff, defendant, etc. as well as at least 3 separate loudspeaker outputs that go to the well, the jury and the gallery. You can allow the judge to mute microphones through the RS-232 control on the EF1210 or through the logic port on the automixer. For recording, use the direct output for each microphone on the automixer to output to an 8-channel recorder.

FURTHER ASSISTANCE

For other system configurations or design assistance, please contact ASPI Digital at:

Application Engineering
ASPI Digital
1720 Peachtree St. NW, Suite 220
Atlanta, GA 30309-2439

Phone: (404) 892-3200
Fax: (404) 892-2512
Email: help@aspi.com

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EF1210 BLOCK DIAGRAM

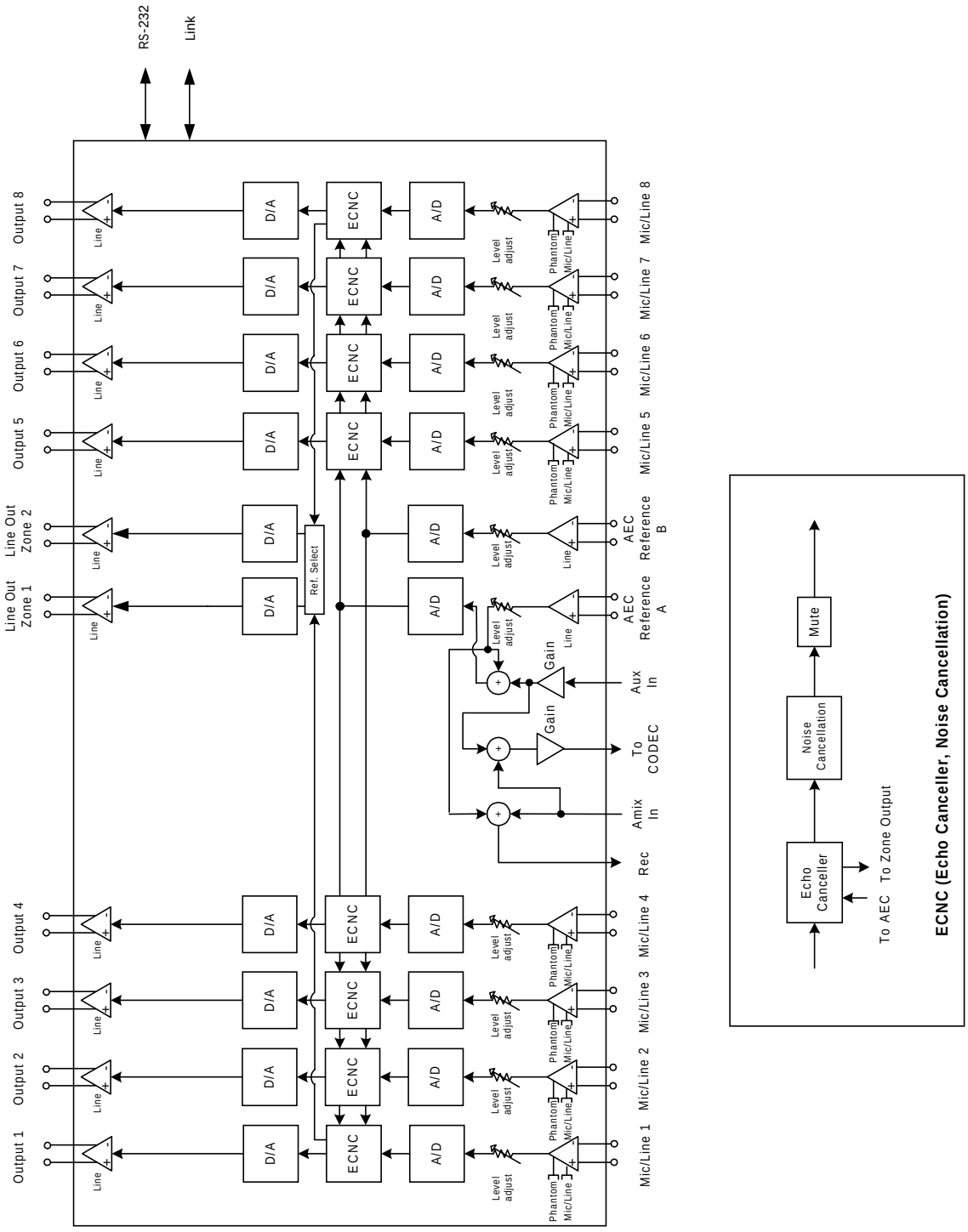
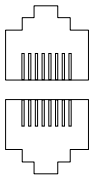


Figure 19. Inside the EF1210

CONNECTOR PINOUTS

ASPI BUS IN

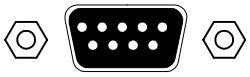


ASPI BUS OUT

ASPI Bus

The ASPI Bus uses RJ45 connectors. These should be used with category five twisted-pair cable.
The total distance of the ASPI Bus should be less than 20 m.

REMOTE CONTROL

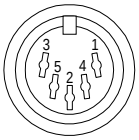


RS-232

RS-232 Port (9600 8-N-1)

The RS-232 port is wired as DCE. It accepts a male DB-9 connector. Only pins 2, 3, and 5 are required by the EF1210. Connect pins straight through (do not use null modem).
1 DCD; 2 TXD; 3 RXD 4 DSR; 5 ground; 6 DTR; 7 CTS; 8 RTS; 9 No connection

+5,±15 VDC



Power Supply Input

The power supply input accepts a 5-pin DIN male connector. Only use the power supply provided by ASPI Digital. Use of other power supplies will void the warranty.

1 Ground; 2 Ground; 3 +5Vdc @ 3 A; 4 -15Vdc @ 0.3 A; 5 +15Vdc @ 1.2 A

Mic/Line Inputs, A Mix In, Aux, AEC Ref, Line Outputs, Rec, To CODEC, Zone Outputs

These audio connectors accept a mini (3.5 mm) 3 conductor terminal block (provided). See Note below for manufacturer information.
From left to right the conductors are positive signal, negative signal, and shield ground.

To avoid ground loops, do not connect shield ground at both ends of the cable (except to microphones — ground is required at both ends for phantom power).

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Note *The information below lists manufacturer information for the Phoenix connector that we use:*

Manufacturer: Phoenix Contact
Description: Mini-COMBICON 3-position plug, 3.5 mm pitch
Type Number: MC 1.5/3-ST-3.5 or MC 1,5/3-ST-3,5
Part Number: 1840379

CONNECTING BALANCED EQUIPMENT TO UNBALANCED EQUIPMENT

CONNECTING UNBALANCED RCA TO BALANCED MINI PHOENIX

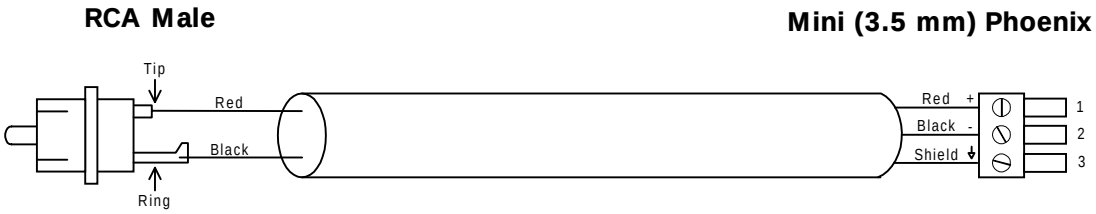

Figure 20. Cable construction for connecting unbalanced RCA to balanced mini Phoenix (3 conductor terminal block).

1. Connect RCA Tip to Phoenix pin 1.
2. Connect RCA Ring to Phoenix pin 2.
3. Connect Phoenix pin 3 to Shield, and leave Shield floating on RCA end.

Caution! ***Do NOT connect the shield at both ends.***

Caution! ***On the EF1210, Phoenix pin 3 is connected to chassis ground. Under no circumstances should Phoenix pin 3 be connected to pin 1 or to pin 2. Doing so will add noise to the audio signal.***

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ECHOFREE™ EFPANEL CONTROL SOFTWARE USER MANUAL

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EFPanelUM-0100-99

ABOUT EFPANEL CONTROL SOFTWARE

INSTALLING EFPANEL

Install EFPanel by copying the executable (EFPanel.exe) onto your hardrive.

Connect an RS-232 cable (see the EF1210 User Manual or the EF200 User Manual for connector pinouts) from the COM port on your computer to the RS-232 port on the EF device. If you would like to control more than one EF device in your system, use a category five twisted pair cable to connect the devices using the ASPI Bus.

> ***Note.*** *This control software and manual may be changed and updated periodically, so please visit our website at http://www.aspi.com for the most recent versions.*

GETTING STARTED

After installing EFPanel, start the executable. When the program is first started, you may initially only see 3 tabs on the application — the **`Serial Port`**, **`Traffic`** and **`About`** pages. Go to the **`Serial Port`** page by clicking on the tab labeled **`Serial Port`**. Choose the appropriate COM port for your computer.

EFPANEL FEATURES FOR ALL EF DEVICES

The following feature descriptions apply to EFPanel for all EF Devices. Following this section are discussions of specific features that pertain only to specific EF Devices.

EF Device Selector

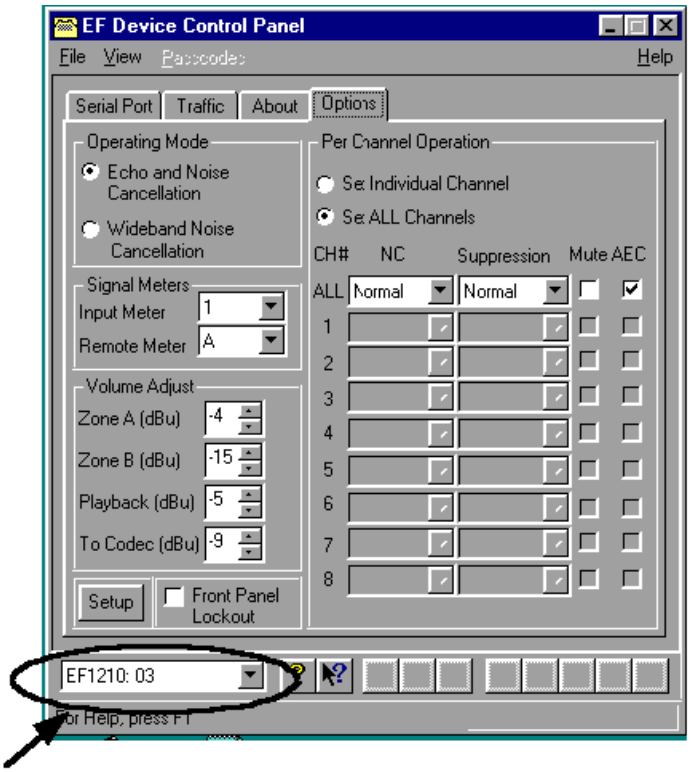

Figure 21. EF Device Selector on EFPanel

This selector has two purposes:

1. It displays a list of all EF Devices that are connected together via the ASPI Bus.
2. It allows you to choose another EF Device to control.

Serial Port Page

Allows you to choose the COM port that you are using on your computer.

Traffic Page

Shows commands that are sent and received from the EF device.

About Page

Displays version of EFPanel Control Software, as well as version of code in the EF device.

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THE EF1210 OPTIONS PAGE

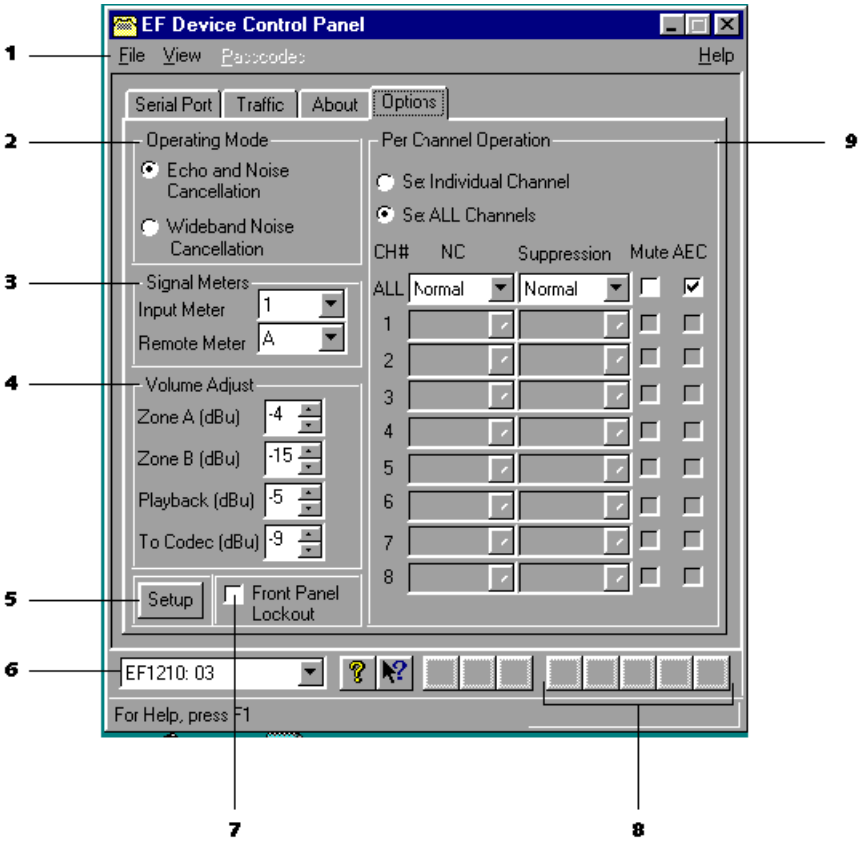

Figure 22. EF1210 Options Page on EFPanel

1. FILE MENU. This menu gives you options to load and save different saved configurations. You can open or save a configuration to a file, restore factory default settings, or restore a configuration from non-volatile memory.
2. OPERATING MODE. Allows you to choose between two modes: Echo and Noise Cancellation mode and Wideband Noise Cancellation mode. When the EF1210 is in Wideband Noise Cancellation mode, the AEC on every input channel is disabled.
3. SIGNAL METERS. Choose which input channel is displayed on the EF1210 front panel INPUT SIGNAL LEVEL INDICATOR and which Reference input is displayed on the REMOTE SIGNAL LEVEL INDICATOR.
4. VOLUME ADJUST. Allows you to adjust volumes on Zone outputs, Playback and To CODEC levels.
5. SETUP BUTTON. This button will put the EF1210 in setup mode and display the first page used for calibration.
6. EF DEVICE SELECTOR. This option shows all the EF devices that are connected via the ASPI Bus and also allows you to choose another EF device to control.
7. FRONT PANEL LOCKOUT. This option locks the front panel so that any button pushed on the EF1210 will have no effect.
8. EF1210 CALIBRATION STEP INDICATOR. Each block in this indicator indicates a

different calibration step. For each calibration step, the appropriate block will light up in blue.

9. PER CHANNEL OPERATION. This section allows you to set the noise cancellation, set suppression mode, mute input channels, and turn the AEC on or off either individually, or applied to all channels at the same time.

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CALIBRATING THE EF1210 WITH EFPANEL CONTROL SOFTWARE

> ***Note.*** *To calibrate the EF1210 using the EFPanel control software, you need to be able to see the EF1210 front panel LED meters.*

If you would like to exit Setup mode at any time, click on the **Cancel** button. All original settings before you entered Setup will be restored.

As you calibrate the EF1210, you can use the EF1210 Calibration STEP INDICATOR on the EFPanel Toolbar (see Figure 22 on page 5) to help keep track of which calibration mode you are in.

To Start EF1210 Calibration

Click on the **Setup** button (see Figure 22 on page 5) to enter configuration mode of the EF1210.

CALIBRATION STEP 1: CALIBRATING MICROPHONE INPUT CHANNELS

For Calibration Step 1, the STEP INDICATOR will be lit in the first position.

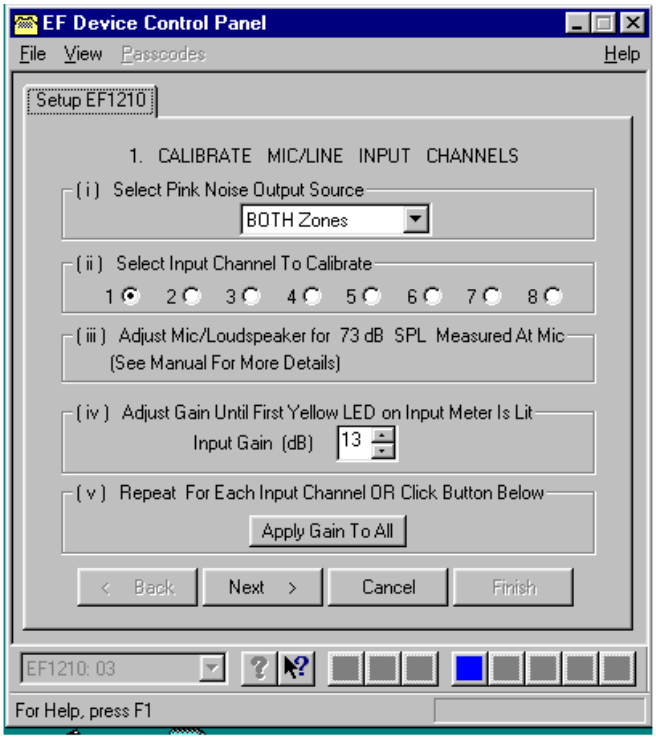
EF Device Control Panel
File View Passcodes Help
Setup EF1210
1. CALIBRATE MIC/LINE INPUT CHANNELS
(i) Select Pink Noise Output Source
BOTH Zones
(ii) Select Input Channel To Calibrate
1 2 3 4 5 6 7 8
(iii) Adjust Mic/Loudspeaker for 73 dB SPL Measured At Mic
(See Manual For More Details)
(iv) Adjust Gain Until First Yellow LED on Input Meter Is Lit
Input Gain (dB) 13
(v) Repeat For Each Input Channel OR Click Button Below
Apply Gain To All
< Back Next > Cancel Finish
EF1210: 03
For Help, press F1

Figure 23. Calibration Step 1: Calibrating Microphone Inputs

i. Select pink noise output source. This is the Zone that will output pink noise for microphone calibration.

- The default choice is pink noise played in both Zone A and Zone B.
- Choose “No noise generated” for no pink noise in Zone A and Zone B.
- Choose “Pink noise to Zone A” for pink noise in Zone A.
- Choose “Pink noise to Zone B” for pink noise in Zone B.

ii. Select input channel to calibrate.

iii. You will need a Sound Level Meter (SPL Meter) for this step. Adjust microphone and loudspeaker to attain the appropriate dB SPL at the microphone using the following steps:

- Set the SPL meter to C weighted, slow response. Choose the appropriate dB SPL range using Table 7 below based on microphone type and the talker’s distance from the microphone.

Table 7: Typical distance from microphone to talker and appropriate dB SPL level.

MICROPHONE TYPE	TYPICAL DISTANCE FROM TALKER (FT.)	SPL LEVEL (dB)
Lavalier	6 inches to 1 foot	89 dB SPL
Gooseneck	1-2 feet	77 dB SPL
Boundary or other tabletop	2-3 feet	73 dB SPL
Ceiling	4 or more feet	69 dB SPL

- Place the SPL meter beside the microphone. Point the SPL meter and the microphone toward the loudspeaker.
- Adjust the microphone/loudspeaker so that a nominal dB SPL level based on Table 7 is registered at the microphone.

Note. *Always double check the microphone level with normal speech once the microphones are in normal operating position. Actual speech levels may vary depending on room reverberation, etc. Verify that you set a reasonable level (three green LEDs and one solid yellow LED, or 0 dB) by actually talking and looking at the meter.*

iv. Adjust level until the first yellow LED (0 dB) on the INPUT SIGNAL LEVEL METER of the EF1210 front panel is lit.

v. Repeat for each input channel or click the **`Apply Gain to All`** button to apply the Input Gain to all input channels. Return all microphones to their normal operating location and orientation.

Note. *It is vital to move the SPL meter and/or microphones so that each microphone sees the correct dB SPL acoustic level as you are calibrating. Do not assume that because the first microphone sees the dB SPL level, all other microphones will see the same level (unless they are moved to occupy the same location as the first).*

Note. *Use caution if the microphones lie in two acoustically separated zones and you are only calibrating one zone. As you cycle through microphones that lie in the other zone, no activity will be indicated on the INPUT SIGNAL LEVEL METER on the EF1210 front panel.*

vi. After all input channels have been calibrated, press the **`Next`** button at the bot-

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tom of the page to proceed to Zone Output calibration.

CALIBRATION STEP 2: CALIBRATING ZONE OUTPUTS

For Calibration Step 2, the STEP INDICATOR will be lit in the second position

This step sets the nominal output level of the ZONE Outputs to match your room audio equipment. This step also lets you mark the maximum room loudspeaker amplification level permissible without violating the room acoustic gain limit.

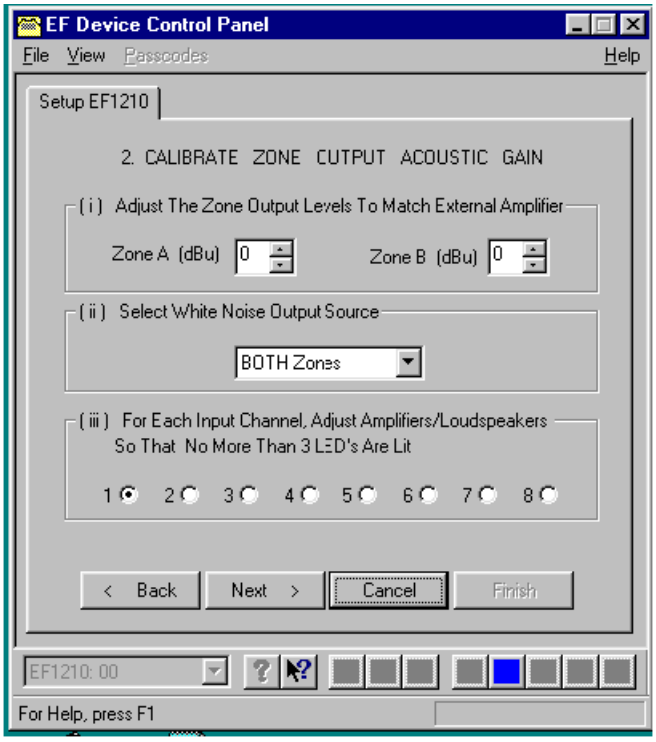
EF Device Control Panel
File View Passcodes Help
Setup EF1210
2. CALIBRATE ZONE CUTPUT ACOUSTIC GAIN
(i) Adjust The Zone Output Levels To Match External Amplifier
Zone A (dBu) 0
Zone B (dBu) 0
(ii) Select White Noise Output Source
BOTH Zones
(iii) For Each Input Channel, Adjust Amplifiers/Loudspeakers So That No More Than 3 LED's Are Lit
1 2 3 4 5 6 7 8
< Back
Next >
Cancel
Finish
EF1210: 00
For Help, press F1

Figure 24. Calibration Step 2: Calibrating Zone outputs

i. Adjust the Zone output levels to match external amplifiers. Check the specifications of your room audio amplifier input:
   - If it expects consumer level (-10 dBV) input, adjust the Zone output gain to -8 dBu (-10 dBV = -7.8 dBu).
   - If it has a balanced input connector and expects 0 dBu input level, adjust the Zone output gain appropriately.

> ***Note.*** *The Zone output gain is also adjustable from -20 dBu to 0 dBu using the UP and DOWN arrows on EFPanel.*

ii. Select pink noise output source. This is the Zone that will output pink noise for microphone calibration. Choosing both Zone A and Zone B together will calibrate both zones at the same time to the same level.
   - The default choice is pink noise played in both Zone A and Zone B.
   - Choose “Pink noise to Zone A” for pink noise in Zone A.
   - Choose “Pink noise to Zone B” for pink noise in Zone B.

If you selected only one of the Zone Outputs, repeat for the second Zone Output.

Check Acoustic Gain.

iii. At this point you are ready to calibrate the absolute maximum room audio amplification level. For this step, you should ensure that the microphones have been returned to their normal operating location and orientation. This procedure uses a known nominal electrical noise signal level at the zone output to let you see if any of the microphone input channels will exceed the permissible acoustic gain during normal conferencing operation. The level of this noise signal is such that if any microphone input channel registers more than three green LEDs on the EF1210 INPUT SIGNAL LEVEL METER, the acoustic gain limit of that microphone channel has been reached. This represents the maximum amplification that may be applied to the room audio. The room audio may be run at any level below this threshold, but should not be amplified beyond this level unless the acoustic gain is reduced by some other means (see the Troubleshooting section in the EF1210 User Manual).

All microphones should be checked in this step as verification that no microphone inputs or zone outputs have been miscalibrated.

As above, both Zones can be adjusted at the same time (both AEC A and AEC B LEDs will be lit indicating Zone A and Zone B). This is recommended because you can check all Input Channels at the same time. Alternatively, if necessary, you may select either Zone by pressing REF SELECT until the appropriate AEC LED is lit and check one Zone at a time.

You should start by selecting (from the radio buttons labeled 1 through 8) and checking the microphone input channel which is closest to the loudspeakers or the microphone which might be expected to pick up the most acoustic energy from the loudspeaker audio, as appropriate. Check the acoustic gain of this microphone using Step a, then quickly step through each of the microphone channels to verify that no other microphone has a stronger signal.

Check and make adjustments for acoustic gain by doing the following:

a. Adjust the external room audio amplifiers/loudspeakers until either:
- The loudspeaker audio level is about to become uncomfortably loud.

OR
- Three green LEDs on the EF1210 INPUT SIGNAL LEVEL METER are lit, but the first yellow (0 dB) LED is not lit for the chosen input channel

b. Next, step through the microphone input channels by choosing each input channel from the radio buttons labeled 1 through 8, while verifying for each channel that the first yellow (0 dB) LED is not lit on the INPUT SIGNAL LEVEL METER.
- If the first yellow (0 dB) LED is lit for any channel, turn down the room audio amplifier on the corresponding zone output or turn down the gain on that microphone channel.

Note. *Do not turn up the room audio level at any point after Step a.*

c. When all input channels have been checked, you can mark the positions of

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the volume controls on the room audio amplifiers and note that this is the absolute maximum amplification that may be applied to room audio. This maximum amplification will be referred to in this manual as the amplifier acoustic gain limit.

> ***Note.*** *The volume control may be set at a lower level than this marked position (amplifier acoustic gain limit), but must not be set higher or the performance of the echo canceller will be suboptimal.*

During normal operation, the zone output levels will be set 6 dB lower than the selected level (amplifier acoustic gain limit) to allow the EFPanel Zone Volume Adjust to apply a volume adjustment to the room audio signal in the range +6 dB to -12 dB.

iv. Once the Zone Output channels and room audio amplifier have been calibrated, click on the **`Next`** button at the bottom of the page to begin the AEC Reference Input calibration

CALIBRATION STEP 3: CALIBRATING AEC REFERENCE INPUTS

For Calibration Step 3, the STEP INDICATOR will lit in the third position.

> ***Note.*** *If you are configuring the EF1210 for operation with one AEC reference input, you will calibrate the AEC A signal.*
> *If you are configuring the EF1210 for operation with two AEC reference inputs, you will calibrate both the AEC A and the AEC B signals.*

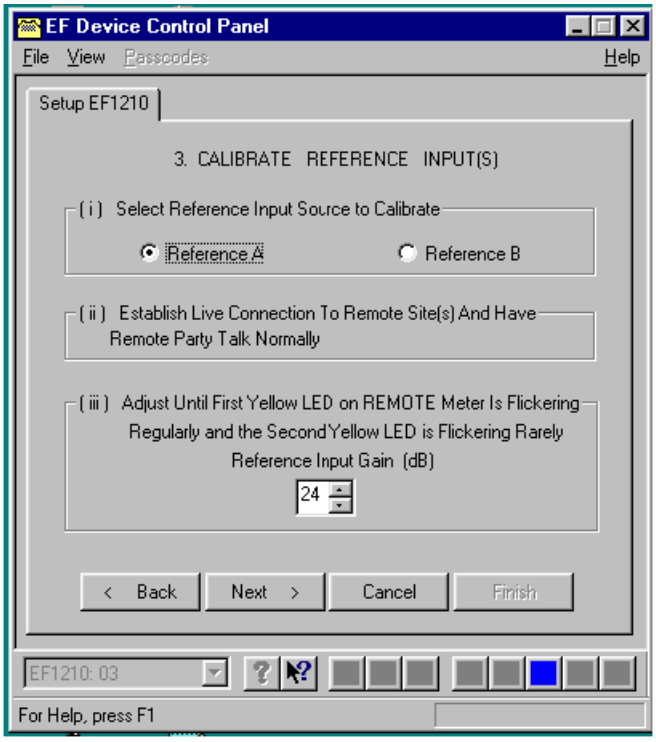
EF Device Control Panel
File View Passcodes Help
Setup EF1210
3. CALIBRATE REFERENCE INPUT(S)
(i) Select Reference Input Source to Calibrate
Reference A
Reference B
(ii) Establish Live Connection To Remote Site(s) And Have Remote Party Talk Normally
(iii) Adjust Until First Yellow LED on REMOTE Meter Is Flickering Regularly and the Second Yellow LED is Flickering Rarely
Reference Input Gain (dB)
24
< Back
Next >
Cancel
Finish
EF1210: 03
For Help, press F1

Figure 25. Step 3: Calibrating AEC Reference Inputs

For this step, you will need a live connection to a remote conferencing site (or two sites if you are configuring the EF1210 for two AEC reference inputs).

i. Select Reference input source to calibrate. Choose either Reference A (AEC A) or Reference B (AEC B).
ii. Establish live connection to remote site(s) and have the remote party talk normally. Have the person at the remote end of the conferencing link sit at a normal distance from a microphone and talk at a normal level while you observe the signal activity on the REMOTE SIGNAL LEVEL METER.

> ***Note.*** *If you have an EF200 Phone Add in your system, you can easily establish a remote connection using the EFPanel Control Software by choosing the EF200 device from the Device List in the Toolbar and dialing to a remote location with the Dialer (the EF200* ***must*** *be connected to the EF1210 by the ASPI Bus as well as the remote input and output — see the EF1210 User Manual for details).*

iii. Adjust the Reference Input Gain until the first yellow LED (0 dB) on the REMOTE METER of the EF1210 front panel is flickering regularly with remote speech and the second yellow LED (+3 dB) is flickering occasionally.
iv. If you are calibrating two AEC Reference Inputs, repeat these steps, choosing the

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other Reference in step i.

> **Caution!** ***If you skip this calibration step, you will compromise the performance of the EF1210. The audio coming from or going to the remote end may be too low, so if you turn up the loudspeaker to compensate, the acoustic gain will be affected.***

v. Once the AEC Reference Inputs have been calibrated, click on the **`Next`** button to proceed to Playback/Record calibration.

CALIBRATION STEP 4: CALIBRATING FOR PLAYBACK AND RECORD

> ***Note.*** *You may skip this step if you are not using playback and record on the EF1210.*

For Calibration Step 4, the STEP INDICATOR will be lit in the fourth position. This step calibrates the TO CODEC signal. No other calibration is necessary for Playback/Record.

The TO CODEC signal may be adjusted to match the level required by your CODEC (or other remote terminal equipment) input.

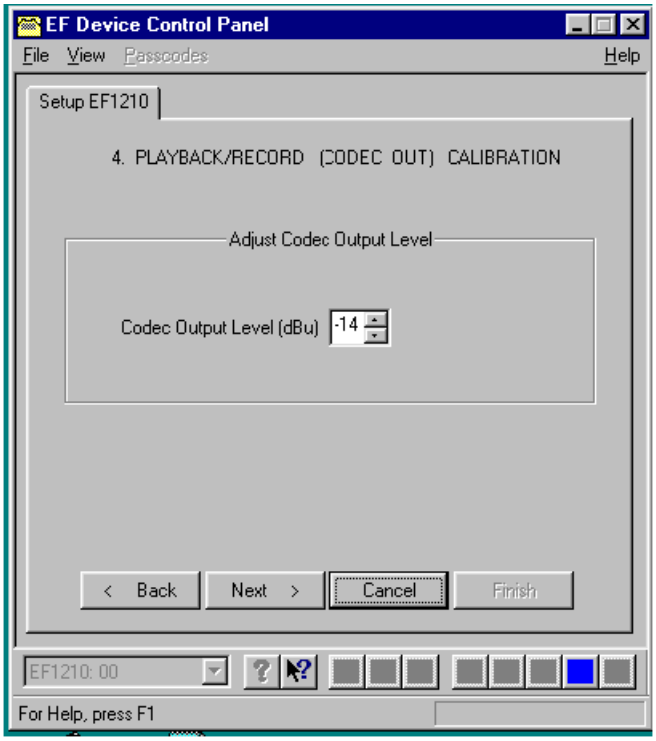

Figure 26. Step 4: Calibrating for playback and record.

i. Adjust CODEC output level. Adjust it to -10 dBV (-8 dBu) or to 0dBu to match the level required by your CODEC.

> ***Note.*** *The CODEC output level is also adjustable from -20 dBu to 0 dBu using the UP and DOWN arrows on EFPanel.*

ii. Once you have completed TO CODEC calibration (you may have skipped this step if you are not using playback and record), click on the **`Next`** button to proceed to Zone/Reference setup.

CALIBRATION STEP 5: ZONE/REFERENCE SETUP

For Calibration Step 5, the STEP INDICATOR will be lit in the fifth position.

During Calibration Step 5, you may set the EF1210 to use different AEC Reference Inputs for each channel. The reference signal used with channel 1 will be used as Zone A output, and the reference used with channel 8 will be used as Zone B output. Microphones on the input channels must be placed in the sound field of the appropriate Zone output for the EF1210 to operate correctly; otherwise echoes will not be cancelled. In other words, if for example the microphone on channel 3 is in the soundfield of the loudspeaker connected to the Zone B output, channel 3 must be configured to use Reference B (AEC B) as its reference.

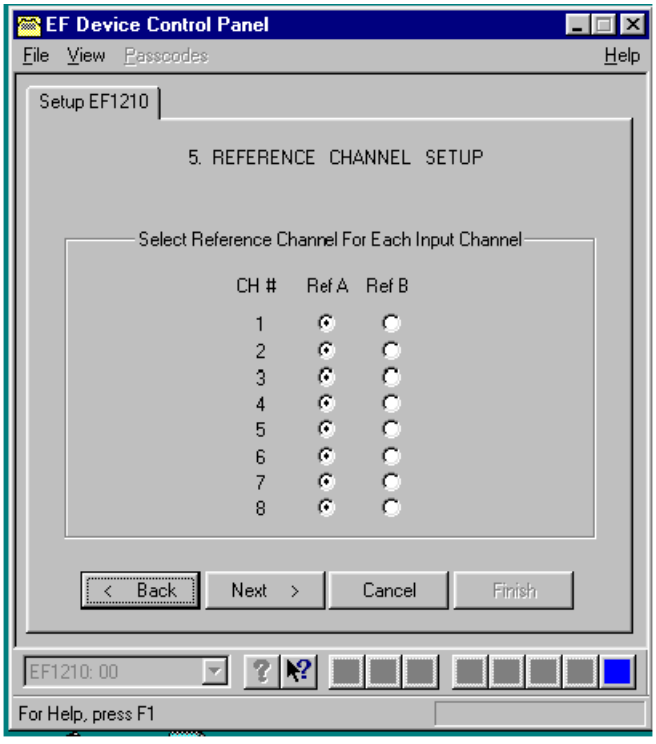

Figure 27. Step 5: Zone/Reference Setup

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i. Select the Reference Channel for each Input channel.

> ***Note.*** *If you are using only one reference signal (Reference A), all microphones must be configured to use that reference signal. If you are using two reference signals (Reference A and Reference B), Input Channel 1 must be associated with Reference A (AEC A) and Input Channel 8 must be associated with Reference B (AEC B). The other 6 microphones can be associated with either reference*

ii. Once you have finished the Zone/Reference Setup, click on the **`Next`** button at the bottom of the page to view options for saving the setup settings

SAVE SETUP SETTINGS

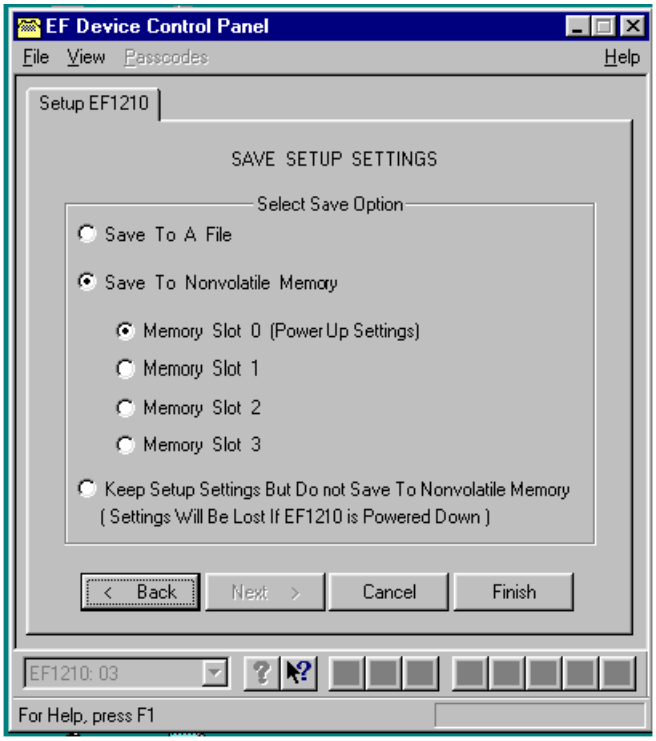
EF Device Control Panel
File View Passcodes Help
Setup EF1210
SAVE SETUP SETTINGS
Select Save Option
Save To A File
Save To Nonvolatile Memory
Memory Slot 0 (Power Up Settings)
Memory Slot 1
Memory Slot 2
Memory Slot 3
Keep Setup Settings But Do not Save To Nonvolatile Memory
(Settings Will Be Lost If EF1210 is Powered Down)
< Back
Next >
Cancel
Finish
EF1210: 03
For Help, press F1

Figure 28. Save Setup Settings

Select Save Option:

- Save to a file. This option saves to a file that can be restored when the EF1210 is in normal operating mode. From the **`File`** menu on the menu bar, choose **`Open Configuration File`** to restore the settings you saved by choosing this option. You can also save a configuration to file at

any time using the **Save Configuration File** option from the **File** menu.

- Save to non-volatile memory. This option saves to non-volatile memory and allows you to choose which memory slot to save to. Settings saved to memory slot 0 will be used as power up settings.
- Keep setup settings but do not save. The settings you made during Setup mode will be applied when the EF1210 is in normal operating mode, but will not be saved.

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EFPANEL FOR THE EF200 PHONE ADD

DIALER

Figure 29. EF200 Dialer on EFPanel Control Software

- DIALER KEYPAD. Use this keypad to dial a phone number, or use the keypad on a computer keyboard to type the phone number. The phone number that are dialing appears in the status bar of EFPanel.
- FLASH. This button works much like the "flash" button on many telephones, used for call waiting features. When the phone is off-hook, clicking this button will hang up the EF200 (putting it on-hook), then immediately pick it up again (off-hook). As this is happening, the PHONE CONNECT LED on the EF200 front panel will turn off (phone on-hook), then turn on again (phone off-hook again).
- REDIAL. This button redials the last phone number that you dialed.
- PRIVACY (MUTE). This mutes (or unmutes) the audio going to the remote end and to the phone from the EF200. This has the same effect as the PRIVACY button on the EF200 front panel and will light the PRIVACY ON LED when enabled.
- PHONE BOOK. This will take you to the Phone Book page of EFPanel for the EF200.
- REMOTE CONNECTED/DISCONNECTED. This button connects or disconnects the audio paths going to and from the remote end. It has the same effect as pushing the REMOTE BUTTON on the front panel of the EF200.

PHONE BOOK

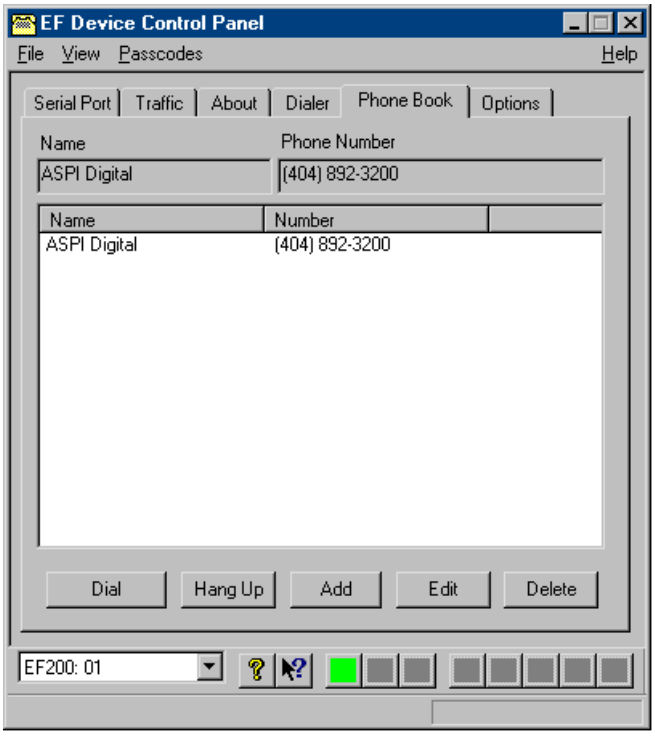

Figure 30. EF200 Phone Book on EFPanel Control Software

- DIAL. Dials the phone number that is highlighted (the phone number that you have chosen).
- HANG UP. Hangs up the EF200.
- ADD. Add a phone number to your phone book.
- EDIT. Edit the names or phone numbers in your phone book.
- DELETE. Delete an entry in your phone book.

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EF200 OPTIONS

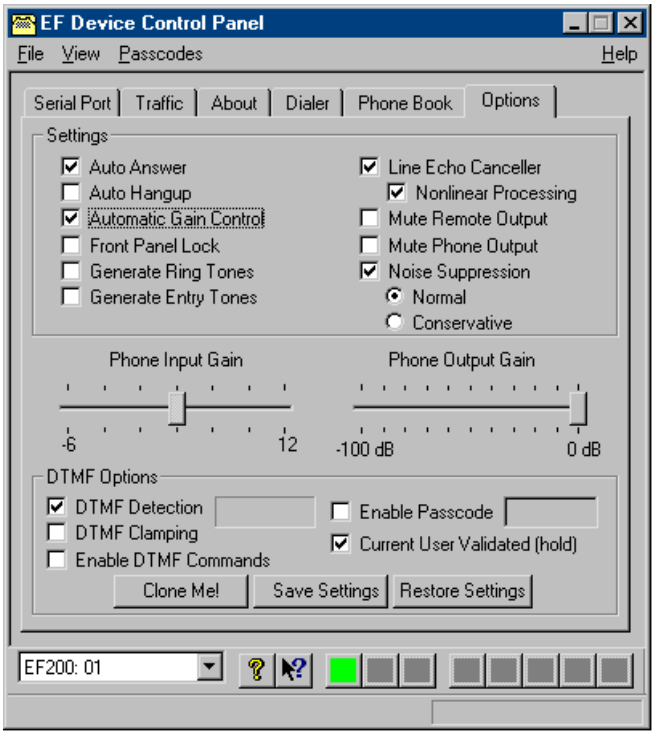

Figure 31. EF200 Options Page on EFPanel

Note *For more information on these options, refer to the EF200 Command Set Reference in the EF200 User Manual.*

- AUTO ANSWER. Enable/disable auto answer mode.
- AUTO HANGUP. Enable/disable auto hangup mode.
- AUTOMATIC GAIN CONTROL. Enable/disable automatic gain control.
- FRONT PANEL LOCK. Lock/unlock front panel (enables/disables front panel buttons).
- GENERATE RING TONES. Enable/disable ring tones.
- GENERATE ENTRY TONES. Enable/disable entry and exit tones.
- LINE ECHO CANCELLER. Enable/disable line echo cancellation.
- MUTE REMOTE OUTPUT. Mutes/unmutes audio going to the remote end from the EF200
- MUTE PHONE OUTPUT. Mutes/unmutes all signals going to the phone interface.
- NOISE SUPPRESSION. Enables/disables noise suppression.
  - NORMAL. Set noise suppression level to 10 dB.
  - CONSERVATIVE. Set noise suppression level to 6 dB.
- PHONE INPUT GAIN SLIDER. Set phone input gain. This slider is disabled if automatic gain control (AGC) is ON.
- PHONE OUTPUT GAIN SLIDER. This controls the level to the phone.
- DTMF DETECTION. Enable/disable DTMF detection.
- DTMF CLAMPING. Enable/disable DTMF clamping. DTMF clamping reduces the received tone level.

- ENABLE DTMF COMMANDS. Enable/disable a series of built-in commands triggered by DTMF digits. The built-in commands are listed in Table 8 below. All commands start with the number 0 and end with a '#' character. For each command, you specify a two digit command code plus a payload.

Table 8: Built-in DTMF commands

CODE	COMMAND NAME	PAYLOAD OPTIONS
AG	AGC	0, 1, 2
GP	GAINP	*5, *4, *3,..., 0,..., 03, 04, 05 The '*' character is used as a minus sign.
LE	LEC	0, 1, 2
NS	NS	0, 1, 2
NL	NSL	06, 10
RM	MUTER	0, 1, 2
PH	MUTEP	0, 1, 2
RC	REMCON	0, 1, 2
PR	PRIVACY	0, 1, 2

For example, to turn PRIVACY on, you would press 0PR1# (which corresponds to 0771#). To turn noise suppression off, you would press 0NS0# (0670#).

- ENABLE PASSCODE. Enable/disable a predefined passcode on incoming calls. The passcode is currently hardwired to the digits that correspond to ASPI ('2774').
- CURRENT USER VALIDATED (HOLD). Puts the caller on hold.
- CLONE ME! Copies EF200 settings of current EF200 to all EF200s connected together via the ASPI Bus.
- SAVE SETTINGS. Save settings to non-volatile memory.
- RESTORE SETTINGS. Restores setting from non-volatile memory.

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